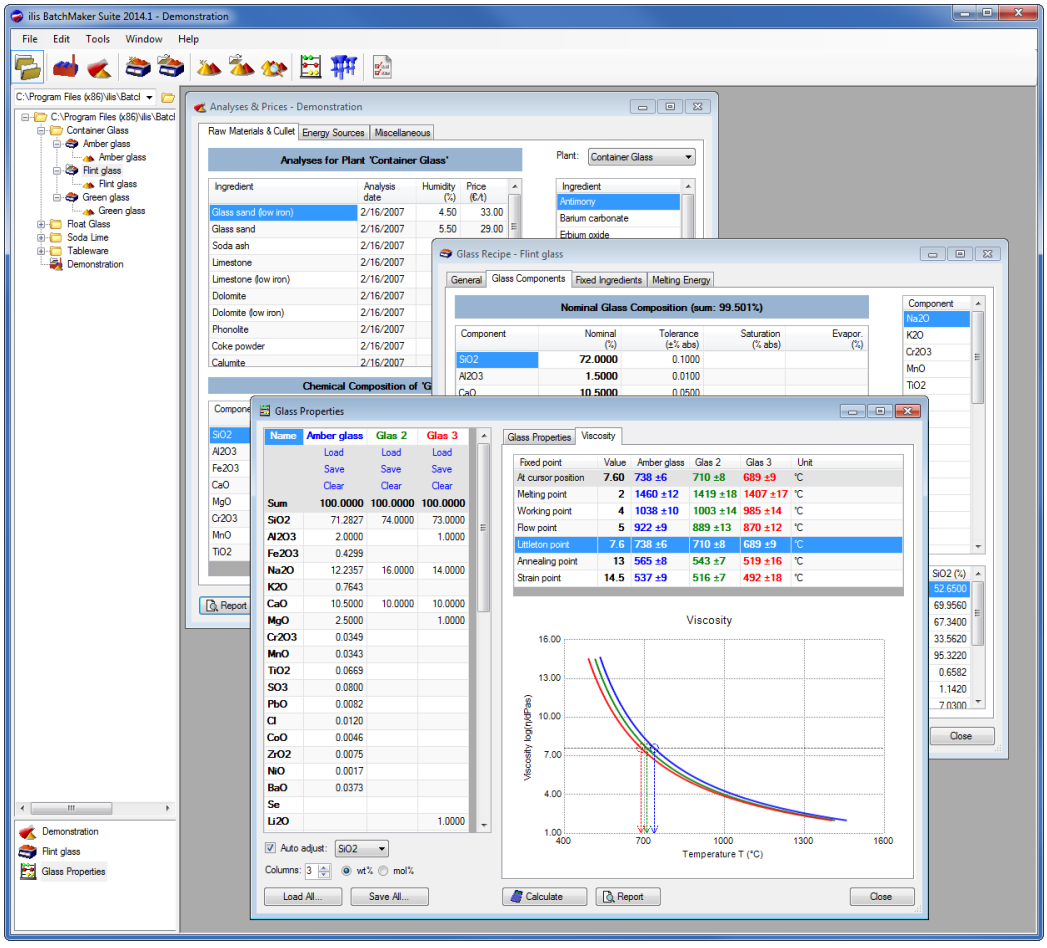
BatchMaker® Suite

User Manual

Version 2014.1



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1 Introduction

This user manual describes the installation of BATCHMAKER SUITE and provides an introduction into the use of the software based on an application example. New users in particular should work through the application example step by step whilst the program is running.

This manual is meant as an introduction only; it does not describe all of the functions of BATCHMAKER SUITE. For more detailed information, please see the Online Help. All the functions are fully explained there.

NOTE: BATCHMAKER SUITE is constantly being developed and improved. The illustrations in this documentation may therefore differ slightly in certain circumstances from how they will appear on the screen. It is also possible that, according to the ordered scope of functions, some of the functions described here are not applicable in your version.

1.1 Introduction

The objective of batch calculation in glass production is compliance with a defined chemical glass composition which determines the properties of the final product (e.g. thermal expansion and refractive index), but also has a decisive influence on the melting properties and processability (e.g. viscosity). Thus batch calculation also has a substantial influence on another large cost factor in glass manufacture, the energy costs.

Great economic importance is attached to the prediction of glass properties, since this can drastically reduce the number of trial melts, and thus the expense of time and costs, in new and further developments of glasses. In addition, many glass properties, such as viscosity, can be determined physically only by much experimentation and measurement.

BATCHMAKER SUITE assists you in the development and production of glasses by the automatic calculation and optimization of raw material weights for the glass composition you specify.

The work with BATCHMAKER SUITE can be broken down roughly into four steps:

- Definition of the master data such as the raw materials, types of cullet and chemical components used.
- Entry and maintenance of the chemical analyses and prices for all raw materials used.
- Production of glass recipes with statement of the wanted chemical glass composition and if necessary definition of fixed ingredients, such as cullet or refining agents.
- Calculation of batch recipes based upon the desired glass recipes, in particular, the computation of the raw material weights.

Moreover BATCHMAKER SUITE offers many useful and practical tools, such as an integrated File Manager, a glass property calculator for predicting and for comparing important glass properties such as viscosity and thermal expansion, and a usage calculator for determining the monthly requirement of raw materials and cullet.

Data storage in the open XML format facilitates easy interfacing with laboratory information systems and batching plants.

1.2 Overview of Sections

The Commissioning section contains instructions for installing BATCHMAKER SUITE. You must work through this section if BATCHMAKER SUITE is not yet on your computer system, or you want to install a more recent version of the software.

In Basic Operating Principles the most important operating and display elements such as windows, menus and buttons are described. You also find out here how to obtain assistance for the individual program functions.

The Example of Application section deals with a typical application of BATCHMAKER SUITE by reference to sample files supplied with the software. You are guided step by step through the program from editing the configuration file through producing a glass recipe up to calculating the corresponding batch recipe and thus you become acquainted with the most important functions of the program.

1.3 Conventions

To make distinctions clearer, different fonts and icons are used in the text:

Labels and file names

`User input`

Cross references

- Enumerations

➲ User actions

1.4 Customer Support

If you have questions on installing or operating BATCHMAKER SUITE, please contact us at the following address. We will be pleased to provide you with further assistance!

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2 Commissioning

In this section you will learn what the minimum requirements of BATCHMAKER SUITE are for your computer system and how to install the software on your computer.

2.1 System Requirements

In order to operate BATCHMAKER SUITE, your computer system must meet the following requirements:

- PC with Intel Pentium 4 processor or compatible (Core i5 or better recommended)
- 1 GB RAM (4 GB recommended)
- 1 GB free hard disk storage
- Color monitor (resolution min. 1024 x 768, 1280 x 1024 or higher recommended)
- Mouse, keyboard
- USB 2.0 interface
- Operating system Microsoft Windows 7 or Windows 8.1 with current Service Pack and current update status
- Microsoft Internet Explorer
- Microsoft .NET Framework Version 4.5.2

2.2 Installing the Software

The installation of BATCHMAKER SUITE is divided into the following steps:

- Installation of Microsoft .NET framework
- Installation of BATCHMAKER SUITE
- Installation of the license module

NOTE: Reference is made several times below to file names with the file extension **.exe**. The extension **.exe** may not be visible under certain circumstances according to the settings of your operating system.

You require at least power user rights and possibly also administrator privileges to your computer for installing software and drivers. If you are in doubt, please contact your system administrator.

2.2.1 Installing the Microsoft .NET Framework

Before BATCHMAKER SUITE is installed it is necessary that the **Microsoft .NET Framework 4.5.2** is installed on your computer, otherwise BATCHMAKER SUITE cannot be used.

To install the Microsoft .NET Framework 4.5.2:

➲ Insert the installation medium.

➲ Open the **Microsoft** folder.

- ➲ Run the file **NDP452-KB2901907-x86-x64-AllOS-ENU.exe** by double clicking and follow the instructions of the setup program.
- ➲ To install the German Language Pack for the Microsoft .NET Framework 4.5.2, run the file **NDP452-KB2901907-x86-x64-AllOS-DEU.exe** from the installation medium und follow the instructions of the setup program. If required, you can download language packs for other languages at http://www.microsoft.com/en-us/download/details.aspx?id=42641.

2.2.2 Installing BatchMaker Suite

NOTE: You can install and use BATCHMAKER SUITE parallel to BATCHMAKER EXPRESS or BATCHMAKER 2005 / 2004.

To install BATCHMAKER SUITE on your computer:

- ➲ Insert the installation medium.
- ➲ Run the **BatchMaker Suite setup.msi** file and follow the instructions of the setup program.

2.2.3 Installing the License Module

BATCHMAKER SUITE is delivered with a license module (dongle), which is plugged into a USB port of the computer. The license module contains your customer data and protects the software against unauthorized access.

NOTE: If the license module is lost, the license to use the software expires.

To install the ilis SoftwareManager and the driver of the license module on your computer:

- ➲ Insert the installation medium.
- ➲ Run the **SoftwareManager Setup.exe** file and follow the instructions of the installation program.

NOTE: To ensure that the USB license module is correctly recognized, you must be logged in with local administrator rights when it is plugged in. Do not remove the license module as long as the computer is switched on.

2.3 Updating the License

The license module is provided with an operating time limit on delivery. The license module and thus the software can be used for an unlimited time only after importing a special activation file, which will be sent to you by email.

To update the license:

- ➲ Double-click the license file made available to you (file extension .v2c).

  The **ilis SoftwareManager** program opens.
- ➲ Click on **Update License**.

  The license is updated.

2.4 Uninstalling the Software

2.4.1 Uninstalling BatchMaker Suite

To uninstall BATCHMAKER SUITE:

- Open the Windows Control Panel.
- Select the **Uninstall a program** option.
- Mark the **BatchMaker Suite** entry in the list of installed programs.
- Click on **Uninstall**.

  The program files are removed from your computer.

NOTE: The data files you have created such as glass recipes, batch recipes, etc., are not removed by the uninstall program and must be deleted manually if necessary.

2.4.2 Uninstalling the License Module

To uninstall the ilis SoftwareManager and the driver of the license module:

- Open the Windows Control Panel.
- Select the **Uninstall a program** option.
- Mark the **ilis SoftwareManager** entry in the list of installed programs.
- Click on **Uninstall**.

  The program and driver files are removed from your computer.

2.5 Starting and Ending BatchMaker Suite

To start BATCHMAKER SUITE:

- Open the Windows **Start** menu.
- Open the **ilis BatchMaker Suite** program folder in the **Programs** menu.
- Select the **BatchMaker Suite** entry.

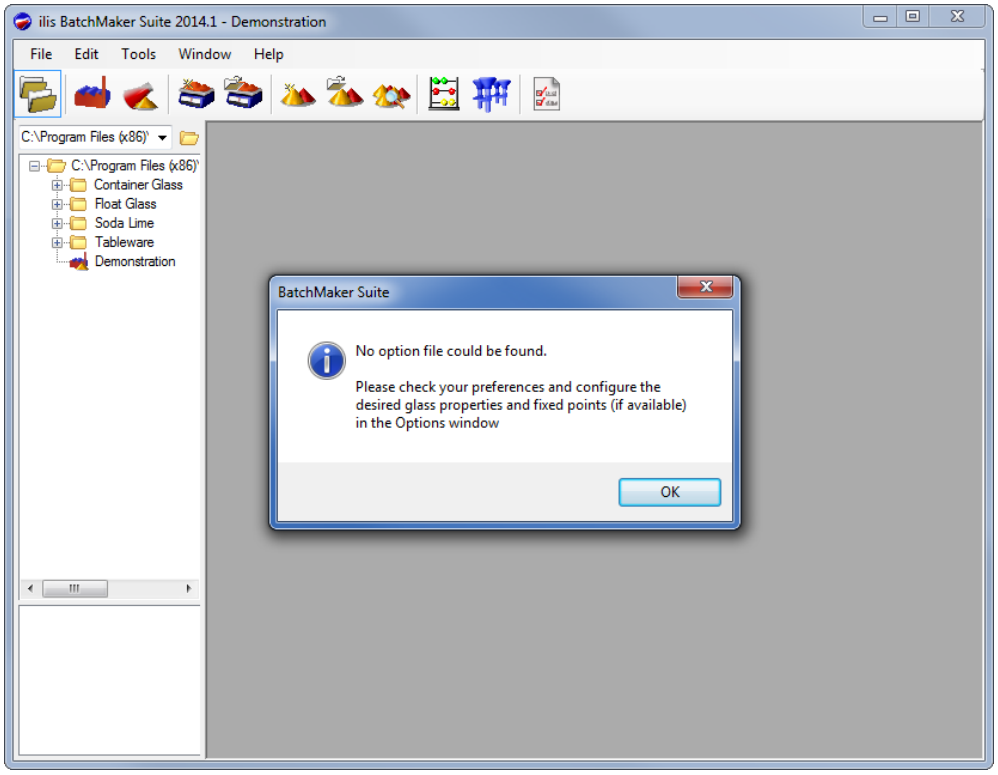
NOTE: The first program start of BATCHMAKER SUITE after booting your computer can take a few seconds depending upon the performance of the computer.

As an alternative you can double click the program icon on your desktop to start BATCHMAKER SUITE.

Once you have completed your work with BATCHMAKER SUITE you exit the program in the **File** menu with **Exit**. As an alternative you can click on the **Close** button of the main window.

2.6 Setting up BatchMaker Suite

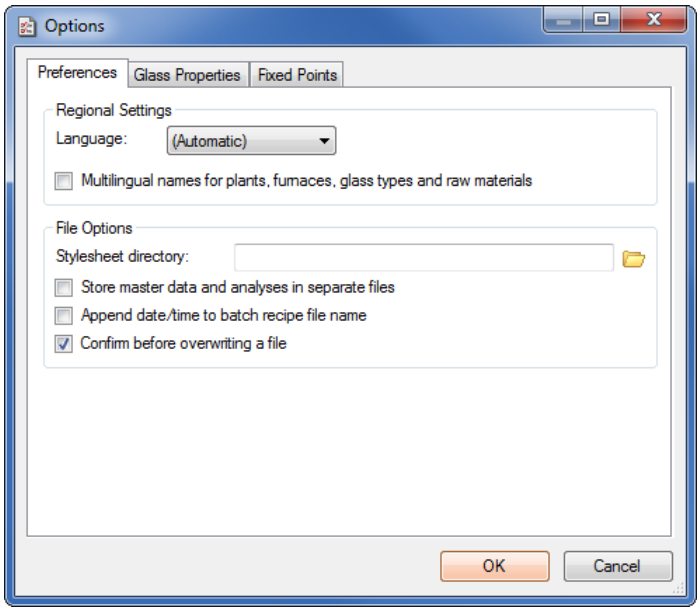
At the first start of BATCHMAKER SUITE you are requested by a message to check the preferences in the **Options** dialog and if necessary to adapt them to your requirements.


ilis BatchMaker Suite 2014.1 - Demonstration
File Edit Tools Window Help
C:\Program Files (x86)\
Container Glass
Float Glass
Soda Lime
Tableware
Demonstration
BatchMaker Suite
No option file could be found.
Please check your preferences and configure the desired glass properties and fixed points (if available) in the Options window
OK

The **Options** dialog is opened automatically after you confirm this message. Only the most important settings are described in the following sections; for a complete reference of the dialog please refer to the Online Help.

2.6.1 Adapting Preferences

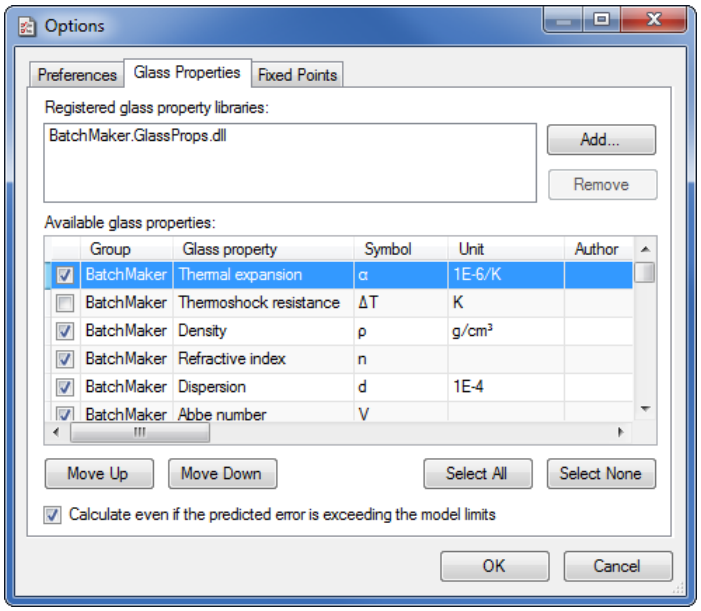
You can make basic settings in BATCHMAKER SUITE on the **Preferences** tab card:



- Select the wanted language of the user interface from the **Language** dropdown list box. If you select **(Automatic)** the language setting of your operating system is used.
- In the **Stylesheet directory** box you can state a folder with XSL stylesheets which BATCHMAKER SUITE should use for displaying reports. If you leave the box empty, the standard templates provided with BATCHMAKER SUITE are used.
- If you activate the **Store master data and analyses in separate files** option, the master data and the analyses are not stored as in version 2005 and older in a common configuration file (file extension .config), but in two separate files with the extensions .master and .analyses.

2.6.2 Selecting Glass Properties

On the **Glass Properties** tab card you can select the glass properties that should be calculated and displayed in the batch calculation and in the glass properties calculator, and register additional glass property libraries:



To register a new glass property library:

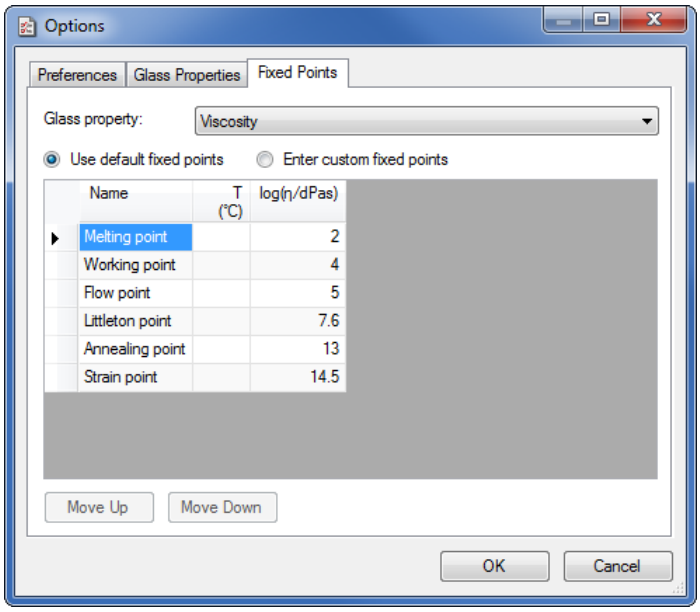
- Click the **Add...** button.
- Select the required library in the **Add Glass Property Library** dialog (file extension .GlassProps.dll) and click the **Open** button.

  The new library appears in the **Registered glass property libraries** list.
- Activate the required glass properties in the **Available glass properties** list.

NOTE: You can adapt the display sequence of the glass properties to your requirements with the **Move Up** and **Move Down** buttons. In this case you can also mark and shift several glass properties simultaneously with **SHIFT** or **CTRL**.

2.6.3 Defining Fixed Points

The fixed points for parameter-dependent glass properties, such as viscosity as function of temperature, are defined on the **Fixed Points** tab card. You see in the **Glass property** dropdown list box all functional glass properties that have been activated on the **Glass Properties** tab card.



➲ Select the required glass property from the **Glass property** dropdown list box.

The fixed points of the selected glass property are displayed in the table.

As a rule the predefined **Default fixed points** are sufficient for the calculation. However, if you want to define your own fixed points:

➲ Activate the **Enter custom fixed points** option.

➲ Enter the wanted fixed points in the table.

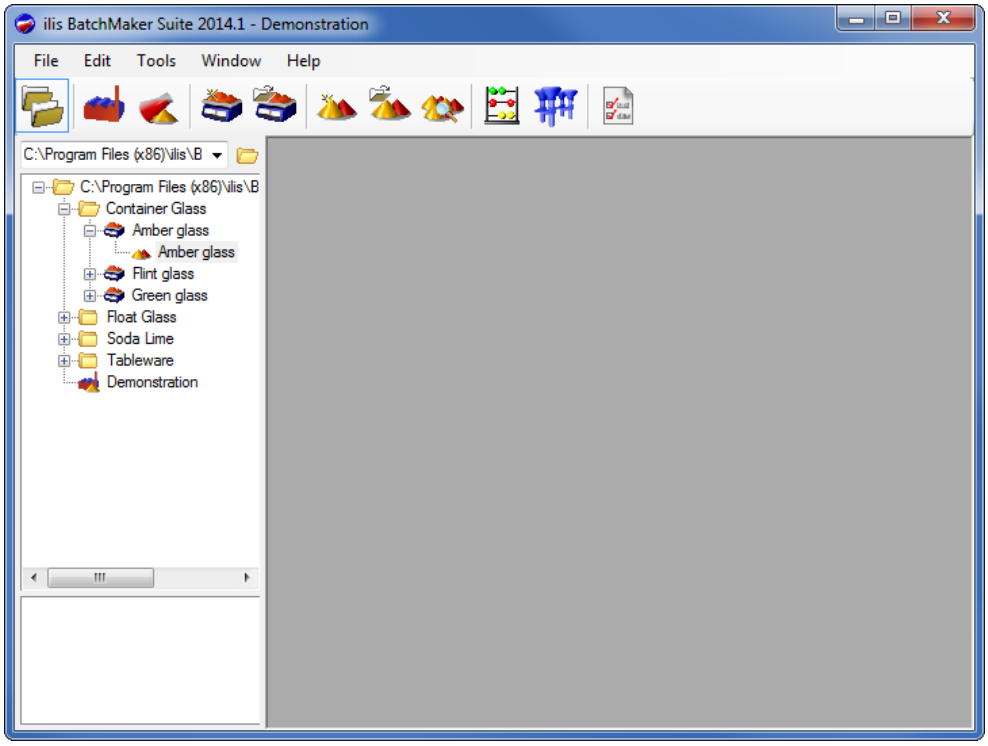
3 Basic Operating Principles

This section explains the basic principles required to operate BATCHMAKER SUITE. The user interface consists essentially of standard elements such as windows, menus and buttons, and you will be familiar with the way they are used from other Windows programs.

The following section assumes that you are familiar with basic information on how to work with the Windows operating system. If you are not familiar with this information, you should first consult the Windows documentation.

3.1 User Interface

After the program has started the main window of BATCHMAKER SUITE appears:



The main window consists of four areas:

- You can reach all program functions through the **menu bar** at the upper edge of the window.
- The most important program functions are accessible via large icons in the **tool bar** underneath the menu bar.
- The **File Manager** in the left margin of the window provides you fast access to your data.
- The remaining area is available for entry and evaluation windows.

Like most of the other windows, the main window has buttons in the top right corner to maximize, minimize or close the window. You can move the window to any position on your screen and change the size of the window. BATCHMAKER SUITE takes note of the position and size of the window and restores these the next time you open the program.

3.1.1 Menu Bar

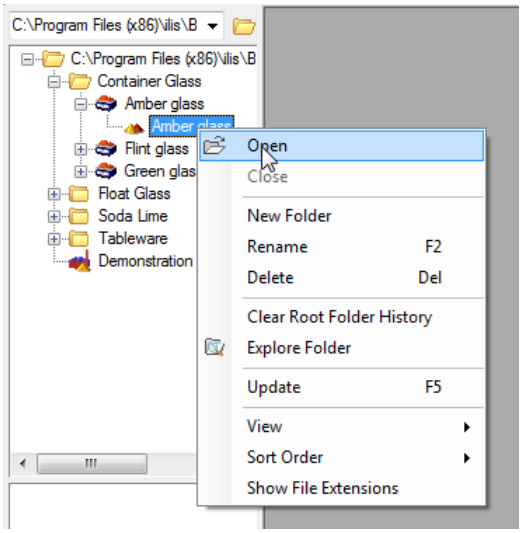
You can use the menu bar to reach all functions of the program. To open a menu, click on it with the mouse. You can select a menu item within a menu by pointing and clicking in a similar manner. For a complete description of all menu commands please refer to the Online Help.

3.1.2 Toolbar

The most important menu items are combined in the toolbar. For example, you can open a glass recipe by selecting the **Open ⇨ Glass Recipe...** menu item in the **File** menu, or simply by clicking on the **Open Glass Recipe** icon in the toolbar. If you let the cursor rest on an icon for some time, an information text on the function of the icon appears.

3.1.3 File Manager

You see in the File Manager as standard all files and folders in the **Samples** subfolder of the program folder. However, you can freely select the master folder, the files and folders of which should be displayed here. Only the files relevant for BATCHMAKER SUITE are displayed in the File Manager, therefore configurations (.config), master data (.master), analyses & prices (.analyses), glass recipes (.recipe), batch recipes (.batch) and glass compositions (.comp).

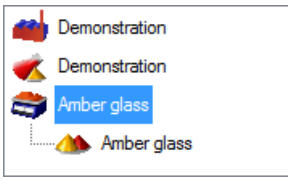


You have several possibilities of opening a file from the File Manager: For instance, you can drag it by Drag & Drop into the working area of BATCHMAKER SUITE, use the open command in the popup menu of the File Manager or double-click the file.

Further commands for working with files are available to you in the popup menu of the File Manager, for instance for renaming or deleting and for adapting the display.

A small folder symbol opposite the relevant file symbol indicates that a file is open for processing in BATCHMAKER SUITE.

You see in a list under the file tree which windows are currently open for processing in BATCHMAKER SUITE and which window is active:



As soon as you mark an entry in the window list, the corresponding window is brought into the foreground.

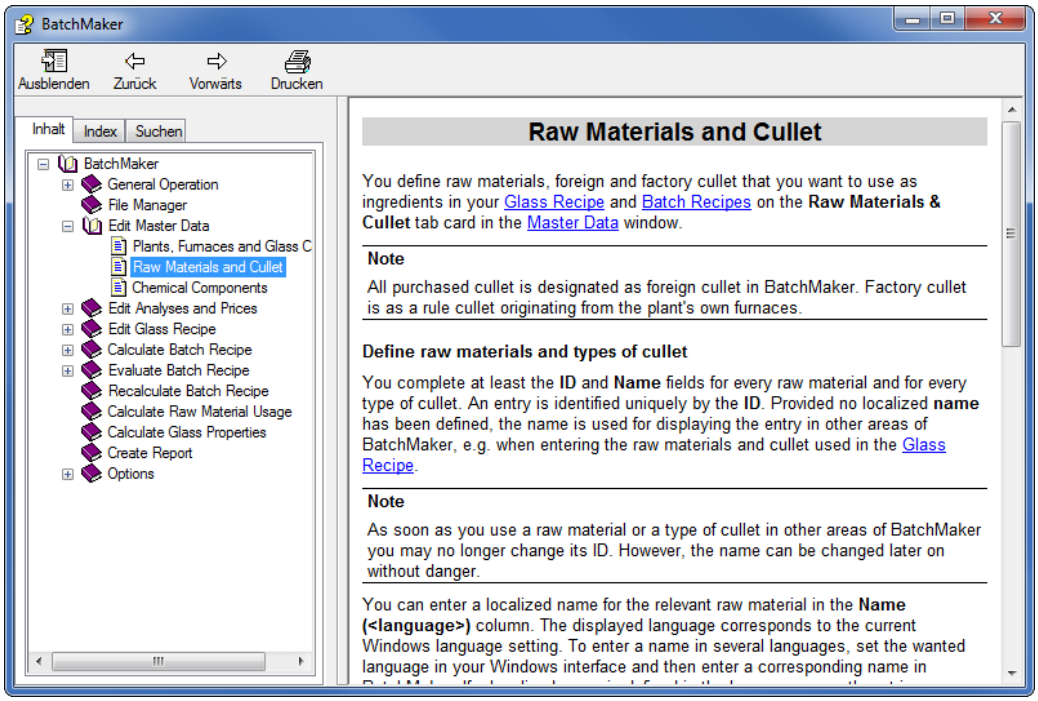
You can show and hide the File Manager using the **File ⇨ File Manager** menu item or the icon of the same name in the toolbar. You can obtain further information on the File Manager in the Online Help.

3.2 Obtaining Help

You can obtain help on the program features for almost any situation in BATCHMAKER SUITE. Pressing the **F1** key causes a window to appear with a description of the program window in which you are currently located.

The Online Help of BATCHMAKER SUITE offers step-by-step explanations for all important operating processes. Cross-references also allow you to find related topics.

You also have access to the classified table of contents and the index through the **Contents** and **Index** menu items in the **Help** menu.


BatchMaker
Ausblenden
Zurück
Vorwärts
Drucken
Inhalt
Index
Suchen
BatchMaker
General Operation
File Manager
Edit Master Data
Plants, Furnaces and Glass C
Raw Materials and Cullet
Chemical Components
Edit Analyses and Prices
Edit Glass Recipe
Calculate Batch Recipe
Evaluate Batch Recipe
Recalculate Batch Recipe
Calculate Raw Material Usage
Calculate Glass Properties
Create Report
Options
Raw Materials and Cullet
You define raw materials, foreign and factory cullet that you want to use as ingredients in your Glass Recipe and Batch Recipes on the Raw Materials & Cullet tab card in the Master Data window.
Note
All purchased cullet is designated as foreign cullet in BatchMaker. Factory cullet is as a rule cullet originating from the plant's own furnaces.
Define raw materials and types of cullet
You complete at least the ID and Name fields for every raw material and for every type of cullet. An entry is identified uniquely by the ID. Provided no localized name has been defined, the name is used for displaying the entry in other areas of BatchMaker, e.g. when entering the raw materials and cullet used in the Glass Recipe.
Note
As soon as you use a raw material or a type of cullet in other areas of BatchMaker you may no longer change its ID. However, the name can be changed later on without danger.
You can enter a localized name for the relevant raw material in the Name (<language>) column. The displayed language corresponds to the current Windows language setting. To enter a name in several languages, set the wanted language in your Windows interface and then enter a corresponding name in

3.3 Working with Files

There are essentially the following types of files with which you work in BATCHMAKER SUITE:

- **Configurations** (file extension .config)
- **Master Data** (file extension .master)
- **Analyses & Prices** (file extension .analyses)
- **Glass Recipes** (file extension .recipe)
- **Batch Recipes** (file extension .batch)
- **Glass Compositions** (file extension .comp)

NOTE: It is possible to save the master data and the analyses in separate files (file extension .master and .analyses) instead of in a common configuration file (.config). You can activate this setting in the **Options** window. As standard the data are saved as in the previous versions in a file with the extension .config. Independently of the selected saving option, the data are edited in two separate **Master Data** and **Analyses & Prices** windows.

3.3.1 Master Data and Analyses

You define all master data and all chemical analyses that you require for producing glass recipes and calculating batch recipes in the master data and in the analyses and prices.

At any point in time, a configuration or a master data and analyses file, the name of which is displayed in the title bar of the main window, is active in BATCHMAKER SUITE. The first time BATCHMAKER SUITE is started the supplied sample configuration **Demonstration.config** is loaded automatically.

BATCHMAKER SUITE notes the currently used configuration or master data and analyses file, and loads this automatically the next time the program is started.

3.3.2 Glass Recipes

A glass recipe in BATCHMAKER SUITE contains the specification for the glass to be produced, e.g. the nominal chemical composition, the raw materials used and the cullet added.

Several glass recipes can be opened simultaneously in BATCHMAKER SUITE.

3.3.3 Batch Recipes

A batch recipe can be entered manually or calculated automatically from the data in a glass recipe and the current raw material analyses. A batch recipe contains the weights of raw materials and cullet for production as well as the glass composition calculated from these. Furthermore, a batch recipe in BATCHMAKER SUITE contains additional data, such as glass properties, which are also calculated from the raw material weights.

As for glass recipes, several batch recipes can be opened simultaneously in BATCHMAKER SUITE.

3.3.4 Glass Compositions

A glass composition contains the chemical composition of a glass. Glass compositions can be saved and loaded within the glass property calculator.

3.3.5 Storage Location of Files

By default, the public documents folder **C:\Users\Public\Documents\ilis\BatchMaker Suite\Samples** is suggested as storage location for all data that you produce with BATCHMAKER SUITE. You can and should store your own files in different folders, e.g. on a network drive. BATCHMAKER SUITE notes for every type of file the folder last used.

You can handle BATCHMAKER SUITE files in Windows Explorer just like other files, e.g. copying or renaming.

3.3.6 Sample Files

A set of sample files, consisting of a configuration (Demonstration.config), several glass recipes and the batch recipes of the same name calculated from them is delivered with BATCHMAKER SUITE. You will find these files in the default storage folder (see above).

NOTE: Please note that the sample files in BATCHMAKER SUITE are only provided as examples and cannot be applied to the production unchanged.

3.4 Working with Windows

In BATCHMAKER SUITE several windows can be opened simultaneously, e.g. the master data, a glass recipe and a batch recipe. The following rules apply here:

- Only one configuration or one master data and analyses file each can be opened (and loaded) simultaneously.
- Several glass recipes can be opened simultaneously. Each glass recipe is displayed in its own window.
- Several batch recipes can be opened simultaneously. Each batch recipe is displayed in its own window.

You see which windows are currently opened in the window list of the File Manager and in the **Window** menu. If you open several windows at one time, note that only the topmost window is active. If you select one of the entries, the corresponding window is activated and brought into the foreground.

Please note also that the commands in the menu bar and in the toolbar always refer to the active window in each case. For instance, if you have opened the master data and a glass recipe, and the glass recipe is active, certain commands in the **File** and **Edit** menus may not be available. In another example, if you have opened several glass recipes, the commands in the **File** and **Edit** menus act only on the glass recipe in the currently active window.

4 Example of Application

The objective of this section is the calculation of a batch recipe with reference to the sample files supplied with BATCHMAKER SUITE. For this purpose the sample configuration is firstly opened and edited. An existing glass recipe is then adapted with this configuration data. A batch recipe is then calculated from the glass recipe data and displayed as a report. Finally, you learn to compare batch recipes, and to work with the glass property calculator and the raw material usage calculator.

NOTE: All parts of the individual windows are not discussed in detail in this manual. You will find a detailed description of all windows and functions in the Online Help.

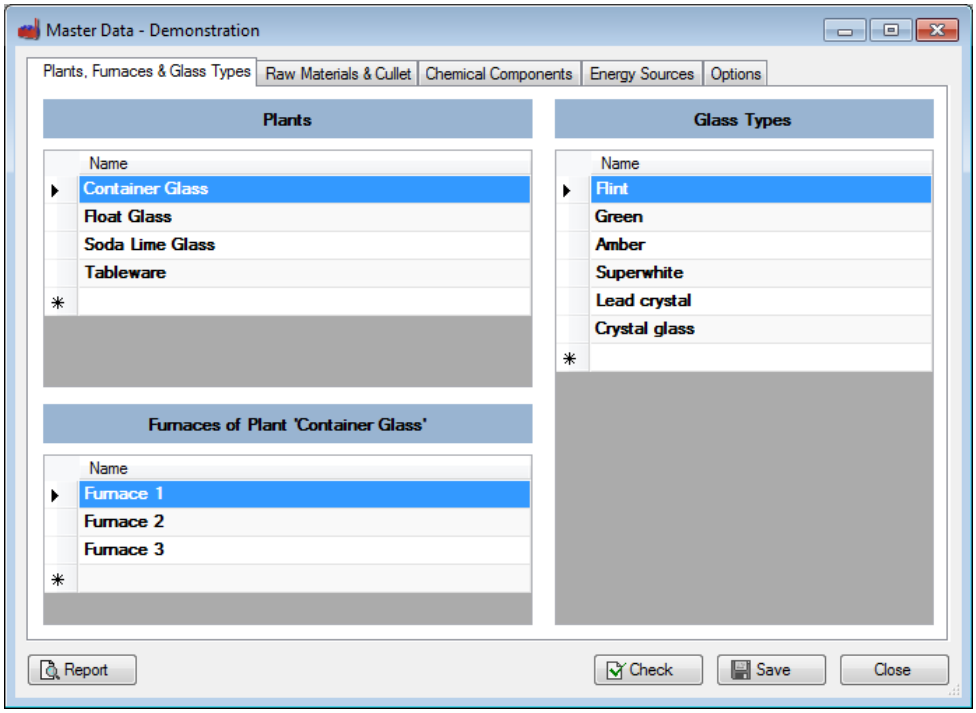
4.1 Opening and Editing Configuration

A configuration or a master data and analyses file must always be loaded to enable work to be done with BATCHMAKER SUITE. At the first start of BATCHMAKER SUITE after the installation, the supplied sample configuration **Demonstration.config** is loaded automatically. The file name of the loaded configuration (without file extension) is displayed in the title bar of the main window.

To open the master data of the configuration for display and/or editing:

➲ Select the **Edit** ⇨ **Master Data** menu command or click the **Edit Master Data** icon in the toolbar.

The **Master Data** window is opened.



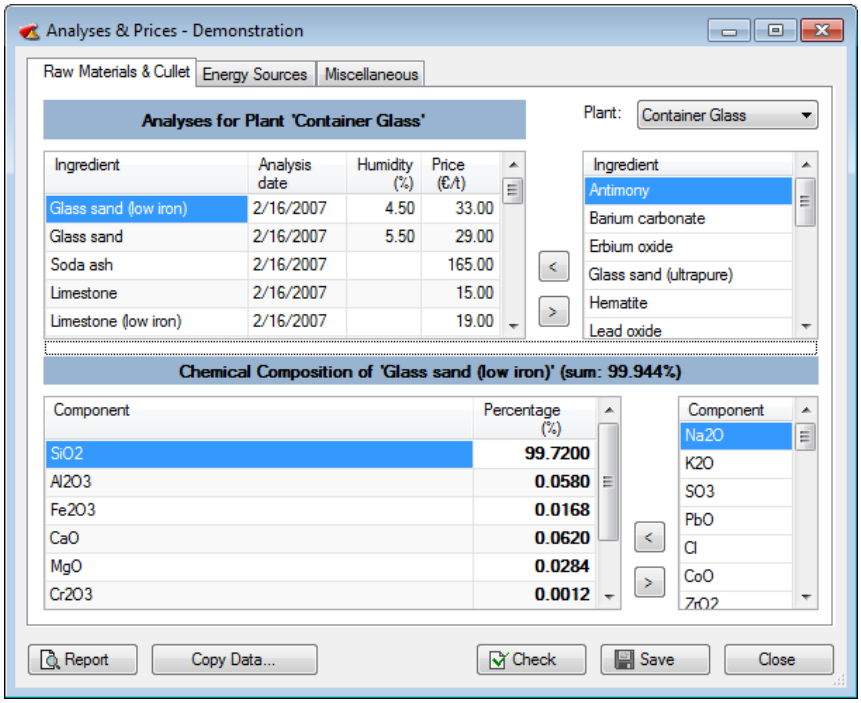
The **Master Data** window is divided into the following tab cards:

- On the **Plants, Furnaces & Glass Types** tab card you define the plants and the furnaces for which you want to produce glass recipes and batch recipes as well as the produced glass types (e.g. amber glass, green glass, lead crystal or opal glass).
- On the **Raw Materials & Cullet** tab card you define the raw materials and types of cullet that you use for glass production.
- On the **Chemical Components** tab card you will find a list of all components that you can use for entering chemical analyses. If you create a new configuration or master data file, a list of all customary components is already predetermined. However, you can also extend or change this list as you require.
- On the **Energy Sources** tab card you define the available energy sources and the corresponding CO_2 emission factors.
- On the **Options** tab card you define the used currency and various other settings for the opened configuration.

To open the analyses and prices for display and/or editing:

➲ Select the **Edit** ⇨ **Analyses & Prices** menu command.

The **Analyses & Prices** window is opened.



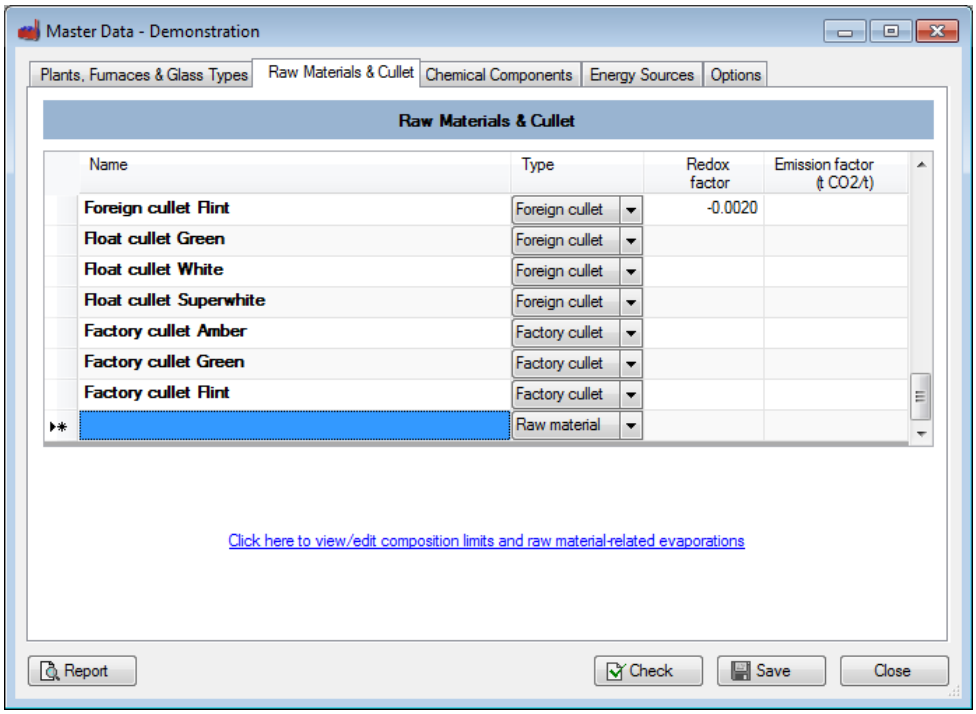
You enter plant-related the chemical analyses for the raw materials and types of cullet that you have defined in the master data in the **Analyses & Prices** window.

You enter data in the tables in two different ways. To become familiar with both types of entry, you create a new raw material in the next steps and enter a chemical analysis for this raw material.

4.1.1 Creating a New Raw Material

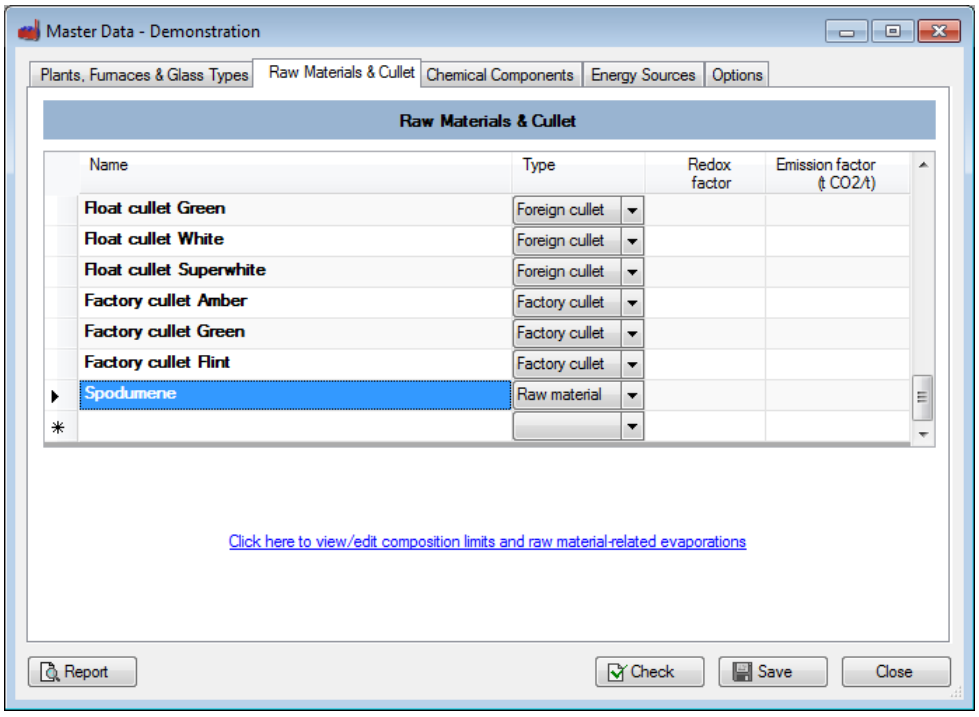
To create a new raw material:

- ➲ Activate the **Raw Materials & Cullet** tab card in the **Master Data** window.
- ➲ Place the cursor with the mouse or the cursor keys in the upper table in the first cell of the last, still empty row (marked with a *).



- ➲ Enter a meaningful **Name** for the raw material, e.g. **Spodumene**.

➲ Select the **Raw material** entry from the **Type** dropdown list box to classify the new raw material.



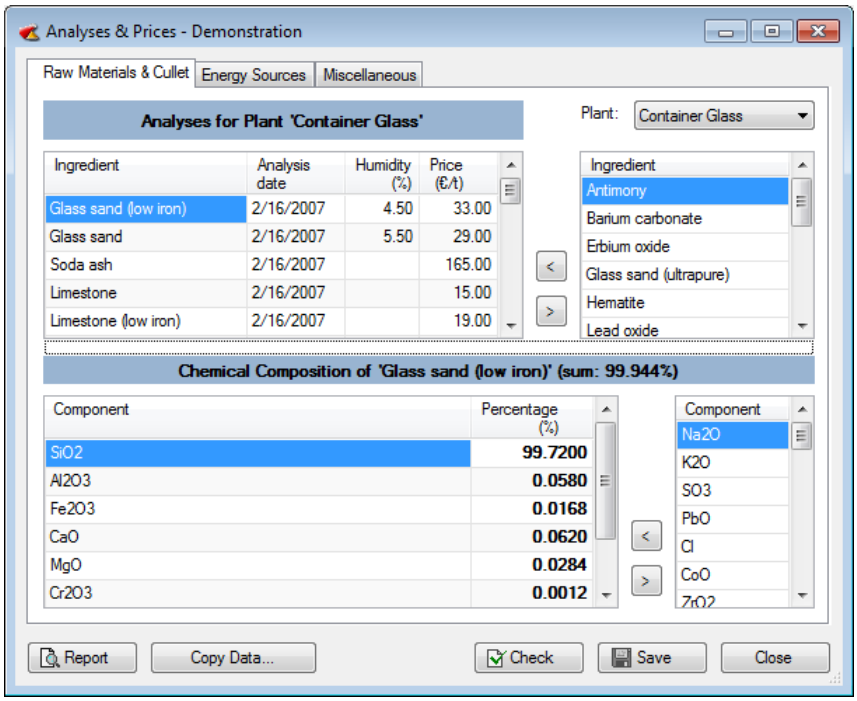
➲ Click the **Save** button to accept your changes. Use if necessary another file name in order not to overwrite the original sample configuration.

4.1.2 Entering Chemical Raw Material Analysis

After you have created a new raw material, you can enter a chemical analysis for this raw material:

➲ Select the **Edit ⇨ Analyses & Prices** menu command or click the **Edit Analyses and Prices** icon in the toolbar.

The **Analyses & Prices** window is brought into the foreground.



The entry area consists here of a main table (upper half of the window) for the assignment of raw materials and cullet to the selected plant and for entry of the associated prices and humidities, as well as a detail table (lower half of the window) in which a chemical analysis is assigned to each raw material or each type of cullet. You will see in list form in each case on the right next to the tables all available raw materials and chemical components as they were defined in the master data in the **Raw Materials & Cullet** and **Chemical Components** areas.

➲ Mark in the right upper selection list the **Spodumene** entry and add it with the button to the main table. As an alternative you can transfer individual entries by double-click with the mouse.

➲ Enter if necessary the analysis date or the date of delivery under **Analysis date**.

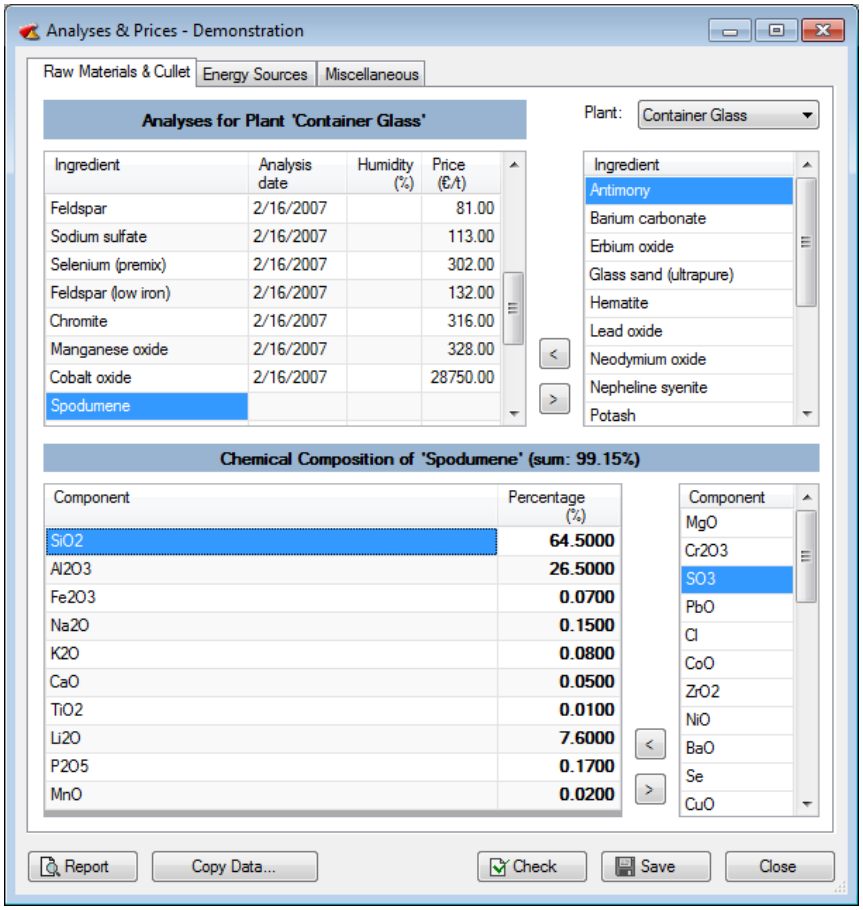
➲ Enter a **Humidity** in weight % if necessary.

➲ Enter the **Price** if necessary.

➲ Now mark the **SiO2** entry in the right lower selection list and move it with the button into the detail table.

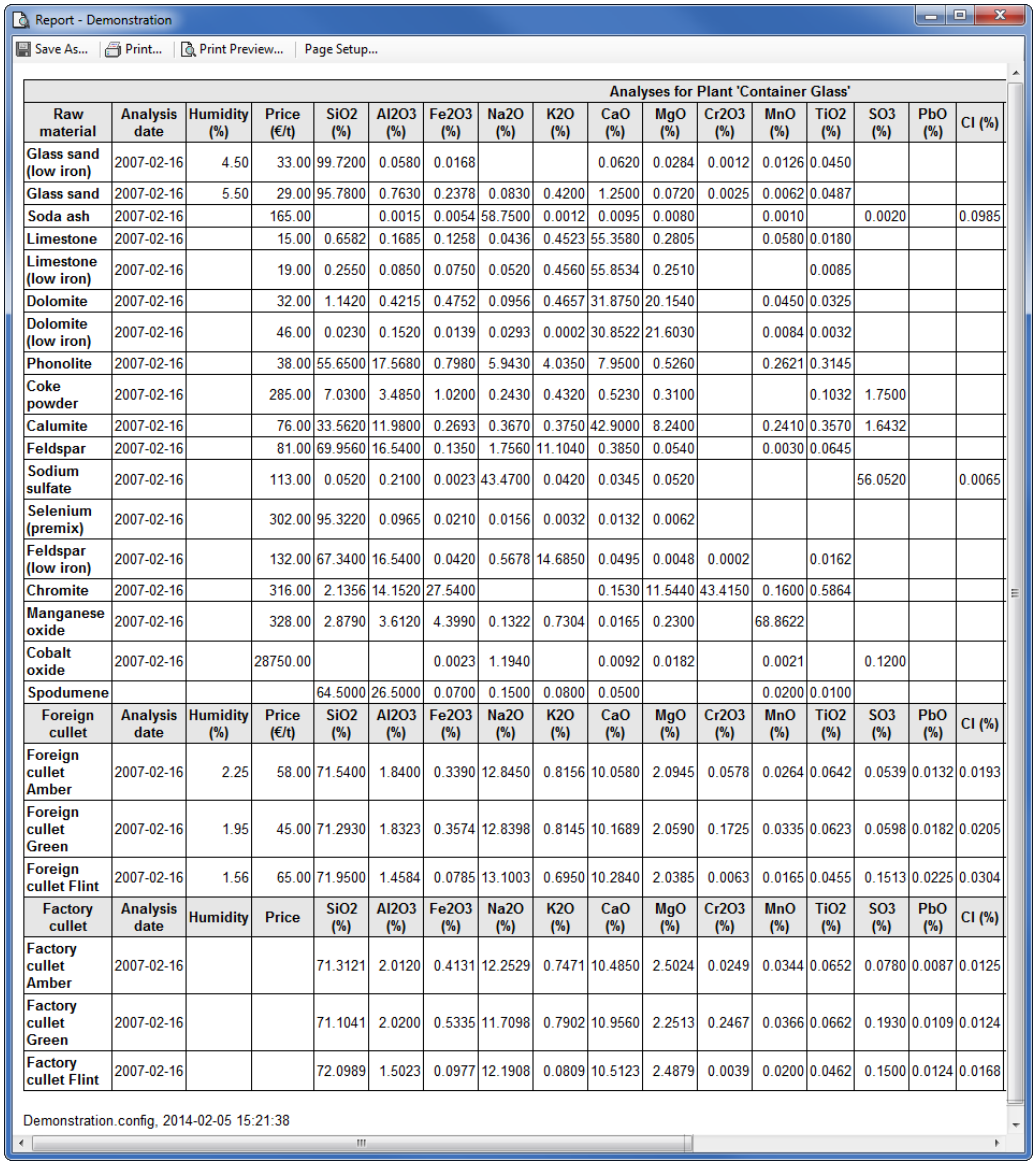
NOTE: Alternatively, you can double-click the entry or use drag & drop to move the entry to the left table.

- Enter as **Percentage** of SiO_2 in the raw material Spodumene **64.5** wt%.
- In the same way, you can enter the other constituents of spodumen and their percentages in the lower table:



NOTE: You can mark several entries in the selection lists and add them to the table at the same time by holding the **SHIFT** or **CTRL** key down. The entries that you have already added to the tables are no longer displayed in the corresponding selection list.

➲ Click the **Report** button to have all analyses clearly displayed in a table.



Report - Demonstration

Save As... | Print... | Print Preview... | Page Setup...

Analyses for Plant 'Container Glass'

Raw material	Analysis date	Humidity (%)	Price (€/t)	SiO2 (%)	Al2O3 (%)	Fe2O3 (%)	Na2O (%)	K2O (%)	CaO (%)	MgO (%)	Cr2O3 (%)	MnO (%)	TiO2 (%)	SO3 (%)	PbO (%)	Cl (%)
Glass sand (low iron)	2007-02-16	4.50	33.00	99.7200	0.0580	0.0168			0.0620	0.0284	0.0012	0.0126	0.0450			
Glass sand	2007-02-16	5.50	29.00	95.7800	0.7630	0.2378	0.0830	0.4200	1.2500	0.0720	0.0025	0.0062	0.0487			
Soda ash	2007-02-16		165.00		0.0015	0.0054	58.7500	0.0012	0.0095	0.0080		0.0010		0.0020		0.0985
Limestone	2007-02-16		15.00	0.6582	0.1685	0.1258	0.0436	0.4523	55.3580	0.2805		0.0580	0.0180			
Limestone (low iron)	2007-02-16		19.00	0.2550	0.0850	0.0750	0.0520	0.4560	55.8534	0.2510			0.0085			
Dolomite	2007-02-16		32.00	1.1420	0.4215	0.4752	0.0956	0.4657	31.8750	20.1540		0.0450	0.0325			
Dolomite (low iron)	2007-02-16		46.00	0.0230	0.1520	0.0139	0.0293	0.0002	30.8522	21.6030		0.0084	0.0032			
Phonolite	2007-02-16		38.00	55.6500	17.5680	0.7980	5.9430	4.0350	7.9500	0.5260		0.2621	0.3145			
Coke powder	2007-02-16		285.00	7.0300	3.4850	1.0200	0.2430	0.4320	0.5230	0.3100			0.1032	1.7500		
Calumite	2007-02-16		76.00	33.5620	11.9800	0.2693	0.3670	0.3750	42.9000	8.2400		0.2410	0.3570	1.6432		
Feldspar	2007-02-16		81.00	69.9560	16.5400	0.1350	1.7560	11.1040	0.3850	0.0540		0.0030	0.0645			
Sodium sulfate	2007-02-16		113.00	0.0520	0.2100	0.0023	43.4700	0.0420	0.0345	0.0520				56.0520		0.0065
Selenium (premix)	2007-02-16		302.00	95.3220	0.0965	0.0210	0.0156	0.0032	0.0132	0.0062						
Feldspar (low iron)	2007-02-16		132.00	67.3400	16.5400	0.0420	0.5678	14.6850	0.0495	0.0048	0.0002		0.0162			
Chromite	2007-02-16		316.00	2.1356	14.1520	27.5400			0.1530	11.5440	43.4150	0.1600	0.5864			
Manganese oxide	2007-02-16		328.00	2.8790	3.6120	4.3990	0.1322	0.7304	0.0165	0.2300		68.8622				
Cobalt oxide	2007-02-16		28750.00			0.0023	1.1940		0.0092	0.0182		0.0021		0.1200		
Spodumene				64.5000	26.5000	0.0700	0.1500	0.0800	0.0500			0.0200	0.0100			
Foreign cullet	**Analysis date**	**Humidity (%)**	**Price (€/t)**	**SiO2 (%)**	**Al2O3 (%)**	**Fe2O3 (%)**	**Na2O (%)**	**K2O (%)**	**CaO (%)**	**MgO (%)**	**Cr2O3 (%)**	**MnO (%)**	**TiO2 (%)**	**SO3 (%)**	**PbO (%)**	**Cl (%)**
Foreign cullet Amber	2007-02-16	2.25	58.00	71.5400	1.8400	0.3390	12.8450	0.8156	10.0580	2.0945	0.0578	0.0264	0.0642	0.0539	0.0132	0.0193
Foreign cullet Green	2007-02-16	1.95	45.00	71.2930	1.8323	0.3574	12.8398	0.8145	10.1689	2.0590	0.1725	0.0335	0.0623	0.0598	0.0182	0.0205
Foreign cullet Flint	2007-02-16	1.56	65.00	71.9500	1.4584	0.0785	13.1003	0.6950	10.2840	2.0385	0.0063	0.0165	0.0455	0.1513	0.0225	0.0304
Factory cullet	**Analysis date**	**Humidity**	**Price**	**SiO2 (%)**	**Al2O3 (%)**	**Fe2O3 (%)**	**Na2O (%)**	**K2O (%)**	**CaO (%)**	**MgO (%)**	**Cr2O3 (%)**	**MnO (%)**	**TiO2 (%)**	**SO3 (%)**	**PbO (%)**	**Cl (%)**
Factory cullet Amber	2007-02-16			71.3121	2.0120	0.4131	12.2529	0.7471	10.4850	2.5024	0.0249	0.0344	0.0652	0.0780	0.0087	0.0125
Factory cullet Green	2007-02-16			71.1041	2.0200	0.5335	11.7098	0.7902	10.9560	2.2513	0.2467	0.0366	0.0662	0.1930	0.0109	0.0124
Factory cullet Flint	2007-02-16			72.0989	1.5023	0.0977	12.1908	0.0809	10.5123	2.4879	0.0039	0.0200	0.0462	0.1500	0.0124	0.0168

Demonstration.config, 2014-02-05 15:21:38

NOTE: You can print the report via the **Print...** button or save it on your hard drive as an HTML file with **Save As...**. For instance, you can send the report in HTML format by e-mail.

➲ Close the **Report** window.

➲ Save and close the **Master Data** and **Analyses & Prices** windows.

The master data and the analyses windows are closed, but the associated files remain loaded as you can see in the title bar of the main window.

When you start BATCHMAKER SUITE the next time, the master data and analyses that were active on ending BATCHMAKER SUITE are always loaded.

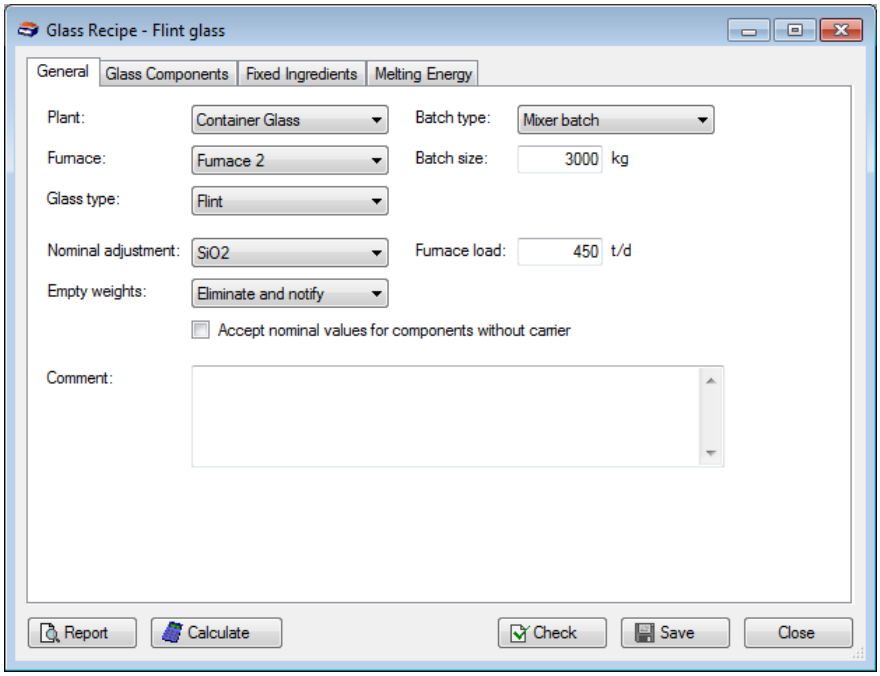
4.2 Opening and Editing Glass Recipe

When you create a new glass recipe or open a glass recipe for editing, note that the master data and analyses appropriate for the glass recipe must be loaded. If the loaded master data and analyses do not fit the opened glass recipe, you may not be able to select certain raw materials or plants or you will use the incorrect analyses for later calculation of the batch recipe.

To open the sample glass recipe for white container glass:

- ➲ Select the **Open ⇨ Glass Recipe...** entry from the **File** menu or click the **Open Glass Recipe** icon in the toolbar.
- ➲ Select the **Flint glass.recipe** file from the **Samples\Container Glass** folder and click the **Open** button.

  The file is loaded and displayed in the **Glass Recipe** window.



4.2.1 General

The master data of the glass recipe are summarized on the first **General** tab card:

- ☐ **Plant**, **Furnace** and **Glass type** describe for which furnace in which plant and for which glass type the glass recipe should be valid. Here you can select the data that you have defined in the currently loaded master data under **Plants, Furnaces & Glass Types**.

NOTE: So that you can enter the glass composition and the fixed ingredients, the plant at least must be selected on the **General** tab card. Otherwise the raw materials and cullet assigned to the plant are not available in the glass recipe.

- ☐ Under **Batch Type** you can select whether the batch recipe should be calculated related to a mixer batch, to the glass amount to be produced (with or without cullet additives) or to a certain raw material.

- You enter in the **Batch size** box, according to selection in the **Batch Type** dropdown list box, the amount in kg that should be used as basis for the calculation of the batch recipe.
- You enter in the **Furnace Load** box optionally the average glass amount produced per day. The required batches per day are calculated from this in the batch recipe.
- You select from the **Nominal adjustment** dropdown list box a component that should be used for automatic nominal value adjustment.

  Example: You specify in the glass recipe a nominal composition that results in total in 99% in order to leave some play (namely 1%) for impurities that are necessarily brought into the glass by raw materials and cullet. However, in fact 1.25% impurities are brought in, so that the total sum would be 100.25%. In this case the nominal value of the component selected here is adjusted so that the sum of the nominal composition results in 98.75% (therefore 100% including the 1.25% impurities).

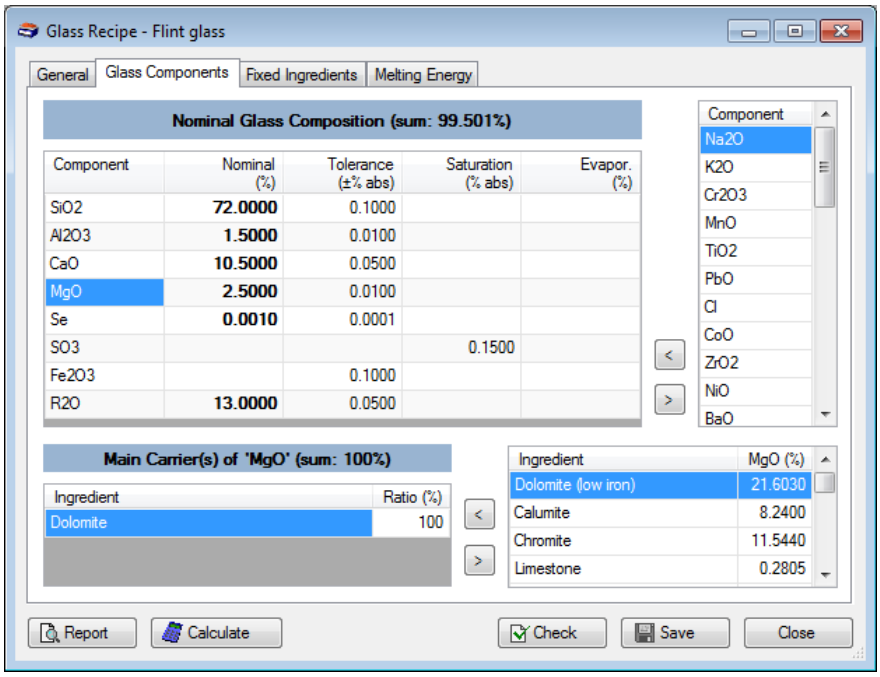
  If you do not want to perform an automatic nominal value adjustment, select the **(None)** entry. In this case the components are adjusted proportionately so that the sum of the calculated glass composition results in 100%.

NOTE: The tolerances in the calculation of the batch recipe are always checked on the basis of the corrected nominal composition!

- You select from the **Empty weights** dropdown list box how raw materials that were stated as carrier raw material but are not required in the batch recipe to achieve the required glass composition should be handled in the calculated batch recipe. For instance, with the **Eliminate and notify** setting raw materials without weights are removed from the batch recipe. However, you will be advised by a corresponding message which raw materials are affected in the calculation of the batch recipe.
- You activate the **Accept nominal values for components without carriers** checkbox if you want to specify nominal values for components that are not brought into the batch by carrier raw materials.
- You can enter a comment in the **Comment** box, which is also taken over in the batch recipe. You can subsequently change this comment in the calculated batch recipe.

4.2.2 Glass Components

You define the wanted chemical composition of the glass to be produced on the **Glass Components** tab card.



You see in the upper main table the components that should be contained in the glass. They were transferred with the arrow buttons from the upper selection list into the table. **Nominal**, **Tolerance**, **Saturation** and **Evaporation** can be entered for each component in the columns. When the batch recipe is calculated the tolerances are checked automatically. There is a corresponding warning if a tolerance is exceeded.

You can state one or several carrier raw materials for each component in the lower table. If you have stated more than one carrier raw material for a component, you define in the **Ratio** column the relative percentages for which the stated raw materials should be used (related to the dry weights). The sum of the percentages must always be 100%.

NOTE: A carrier raw material is a raw material that introduces a chemical component expressed as a percentage of its total chemical composition. For example, glass sand is normally used as the carrier raw material for SiO_2. When calculating a batch, BATCHMAKER SUITE automatically takes into consideration other raw materials that also bring significant amounts of SiO_2 into the glass (for example, feldspar as the main carrier of Al_2O_3), and allows for this.

Only a tolerance but no nominal value is stated in this glass recipe for the oxide Fe_2O_3. If you mark the row with the mouse, you also see that no carrier raw material was defined in the lower table. In this way the percentage of Fe_2O_3 which is necessarily brought into the glass as impurity by the raw materials can be monitored. If the percentage in this example exceeds 0.1 weight %, there is a warning in the calculation of the batch recipe, and you can correct the excess by using an alternative raw material, for instance.

Only a saturation value is specified in this glass recipe for the oxide SO_3. No carrier raw material is stated, therefore SO_3 is brought into the glass only indirectly by the other raw materials. A maximum of 0.15 weight % SO_3 in the glass is taken into account by the statement of the saturation value; that which is brought in above this amount is considered to be evaporated.

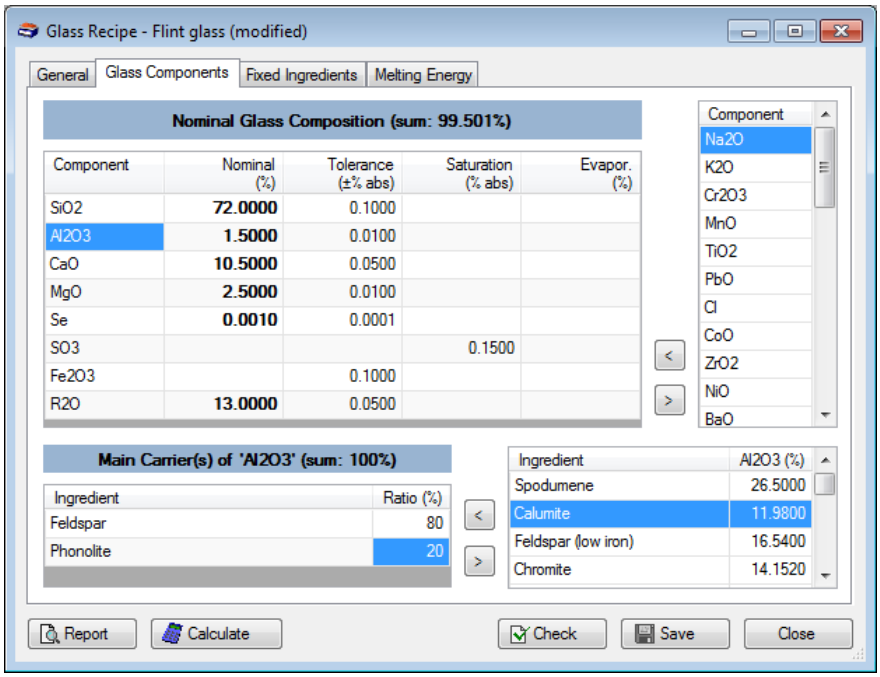
You can also state only an evaporation value for a component, for instance, without defining a carrier raw material.

- You mark the component **Al2O3** in the **Nominal Glass Composition** table.

  Feldspar is shown as sole carrier raw material of Al_2O_3 in the lower table.

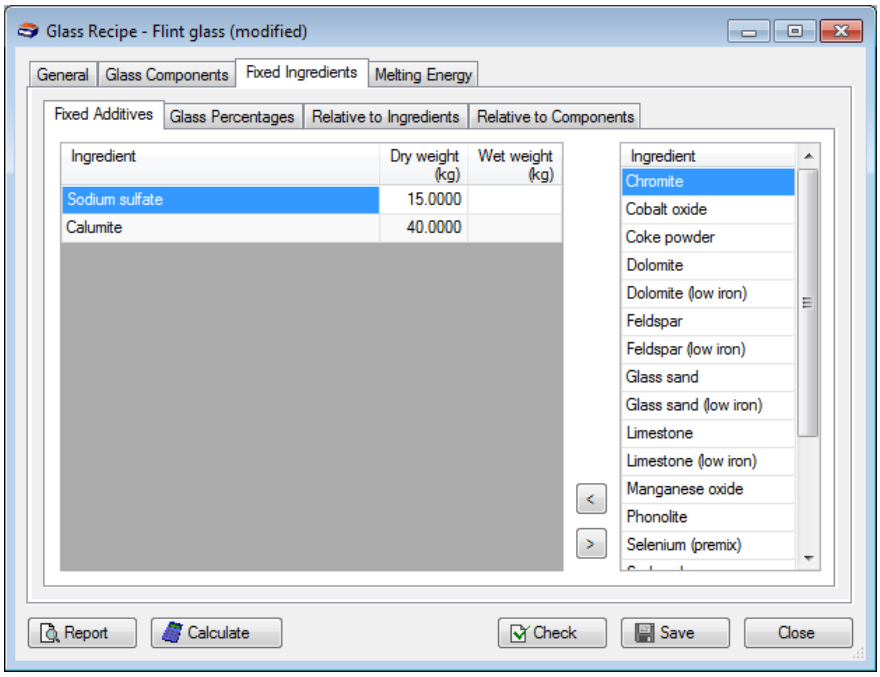
- You add **Phonolite** as second carrier raw material from the ingredient list to the table.

- You change the ratio of feldspar to phonolite in the **Ratio** column to 80% to 20%.

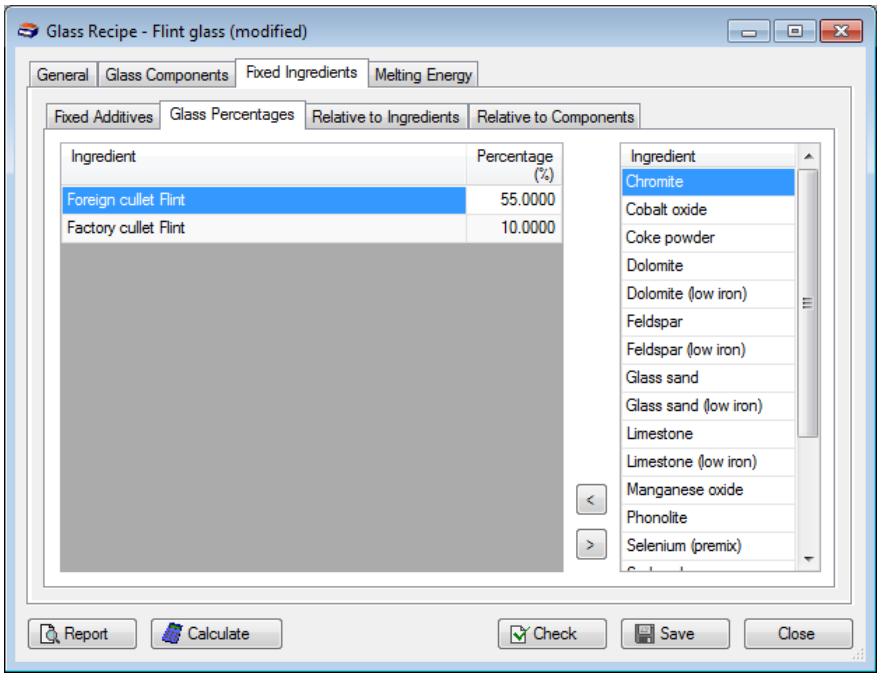


4.2.3 Fixed Ingredients

The **Fixed Ingredients** tab card is divided into the four **Fixed Additives**, **Glass Percentages**, **Relative to Ingredients** and **Relative to Components** subareas.



Fixed ingredients are amounts of raw materials or cullet that are not calculated through the nominal chemical composition of the glass, but are added to the batch absolutely in kg or relatively in weight % (related to the glass amount, a certain ingredient or a component). As a rule raw materials are stated as fixed additives in kg, cullet as glass percentage.



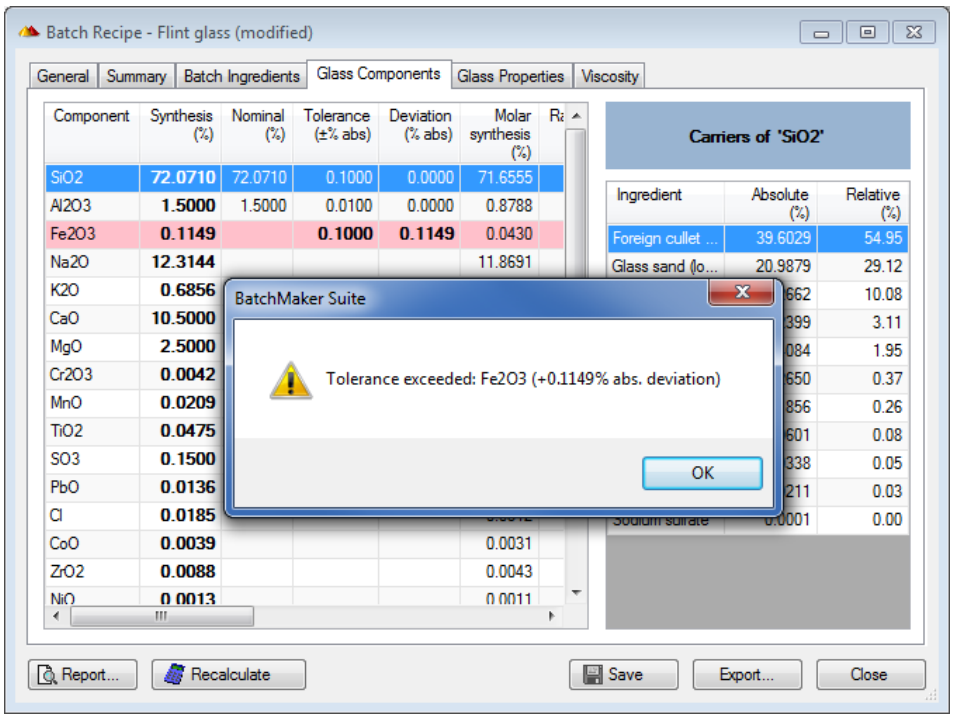
You leave the glass recipe open to calculate the associated batch recipe in the following step.

4.3 Calculating Batch Recipe

To calculate the batch recipe from the sample glass recipe:

➲ Select the **Calculate** command from the **Edit** menu or click the icon with the same name in the toolbar or the **Calculate** button in the glass recipe window.

The calculated batch recipe is displayed in the **Batch Recipe** window. At the same time there is a warning that the tolerance value for Fe_2O_3 was exceeded in the calculation.



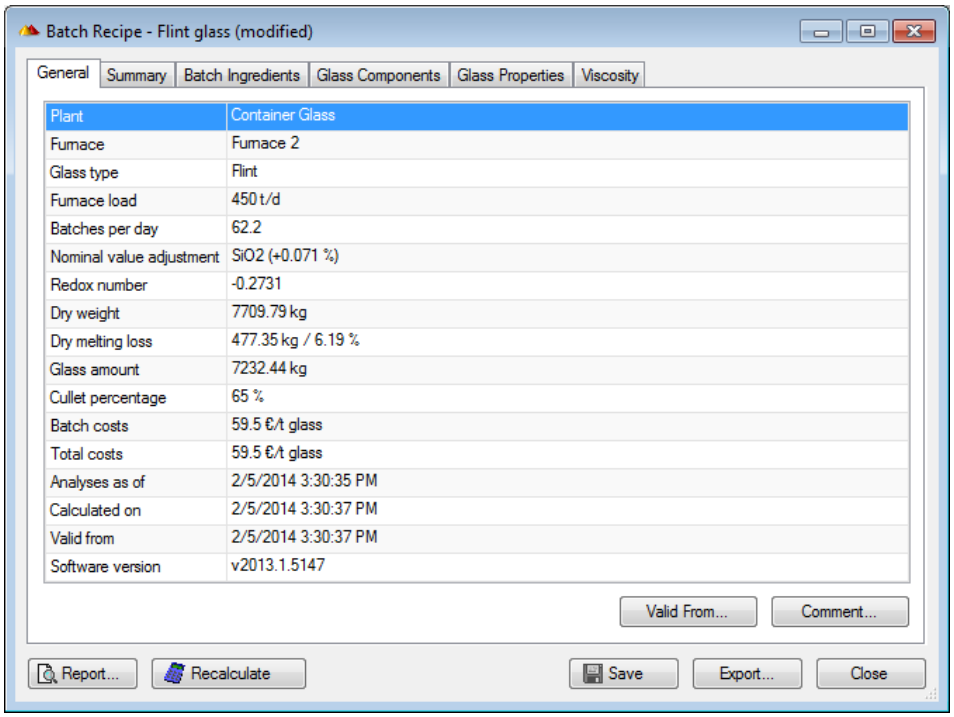
➲ Acknowledge the warning with **OK**.

The row with the Fe_2O_3 entry is highlighted in red. Thus you see directly the components for which tolerances were exceeded.

➲ You activate one after the other the individual tab cards of the batch recipe (you obtain detailed information about each tab card in the Online Help).

4.3.1 General

The master data of the batch recipe are summarized on the **General** tab card.



You see in the **Analyses as of** row the date and the time of the last saving of the associated analyses file.

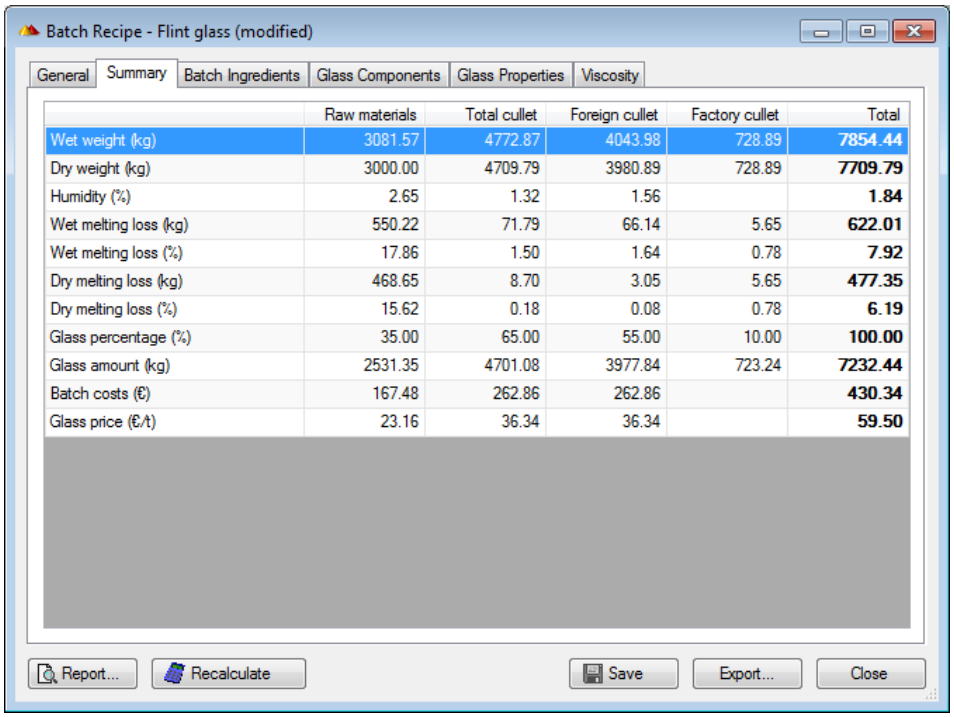
The **Valid from** row states the time from which this batch recipe should be used in production. You can change this value using the **Valid From...** button.

The nominal value correction performed in the calculation is stated in the **Nominal value adjustment** row. In this example the nominal value for SiO_2 was increased by 0.071%.

The **Redox number** of the batch was calculated from the weights on the basis of the Redox factors filed in the master data.

4.3.2 Summary

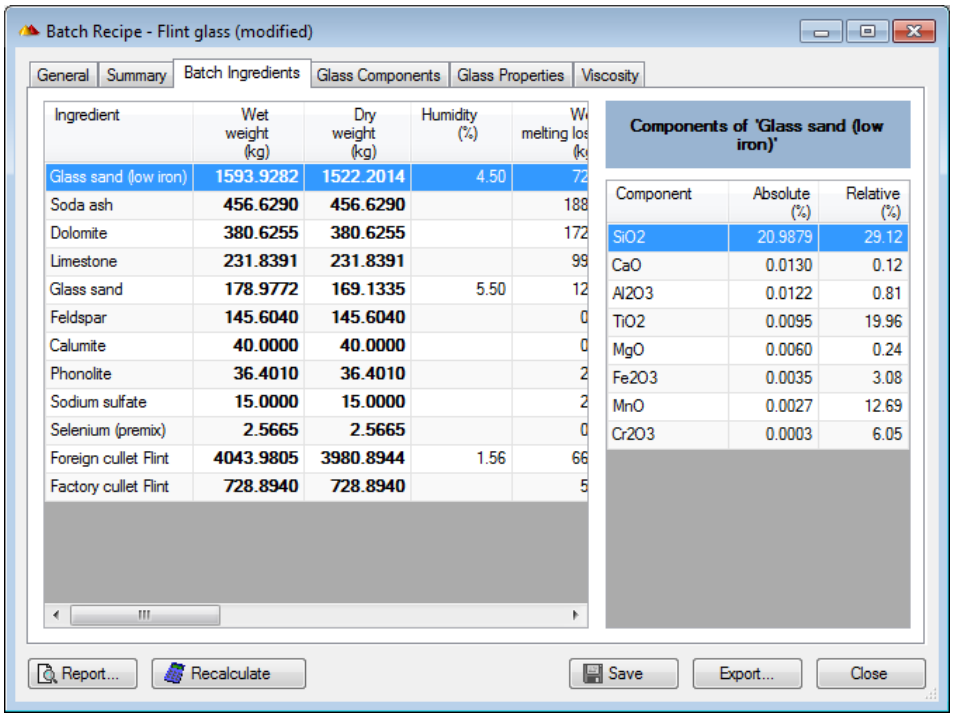
The summed weights, humidities, melting losses, glass percentages, glass amounts and price percentages of raw materials, factory cullet and foreign cullet are listed on the **Summary** tab card. In addition, information on the total amount of glass produced is displayed, the total cullet percentage and the glass price percentages for the raw materials and cullet used.



	Raw materials	Total cullet	Foreign cullet	Factory cullet	Total
Wet weight (kg)	3081.57	4772.87	4043.98	728.89	**7854.44**
Dry weight (kg)	3000.00	4709.79	3980.89	728.89	**7709.79**
Humidity (%)	2.65	1.32	1.56		**1.84**
Wet melting loss (kg)	550.22	71.79	66.14	5.65	**622.01**
Wet melting loss (%)	17.86	1.50	1.64	0.78	**7.92**
Dry melting loss (kg)	468.65	8.70	3.05	5.65	**477.35**
Dry melting loss (%)	15.62	0.18	0.08	0.78	**6.19**
Glass percentage (%)	35.00	65.00	55.00	10.00	**100.00**
Glass amount (kg)	2531.35	4701.08	3977.84	723.24	**7232.44**
Batch costs (€)	167.48	262.86	262.86		**430.34**
Glass price (€/t)	23.16	36.34	36.34		**59.50**

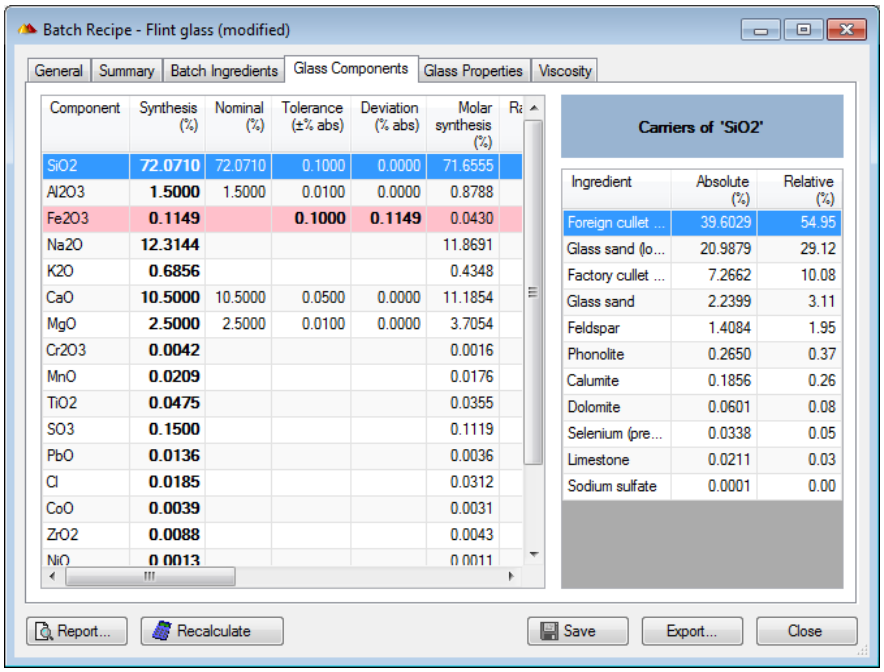
4.3.3 Batch Ingredients

The individual raw material and cullet weights (dry and wet) as well as the relevant melting losses, glass, cost and price percentages are listed on the **Batch Ingredients** tab card. The oxide balance of the raw material marked in the left table in each case is shown in the detail table in the right part of the window.



4.3.4 Glass Components

You see the calculated composition of the glass compared to the nominal composition on the **Glass Components** tab card.



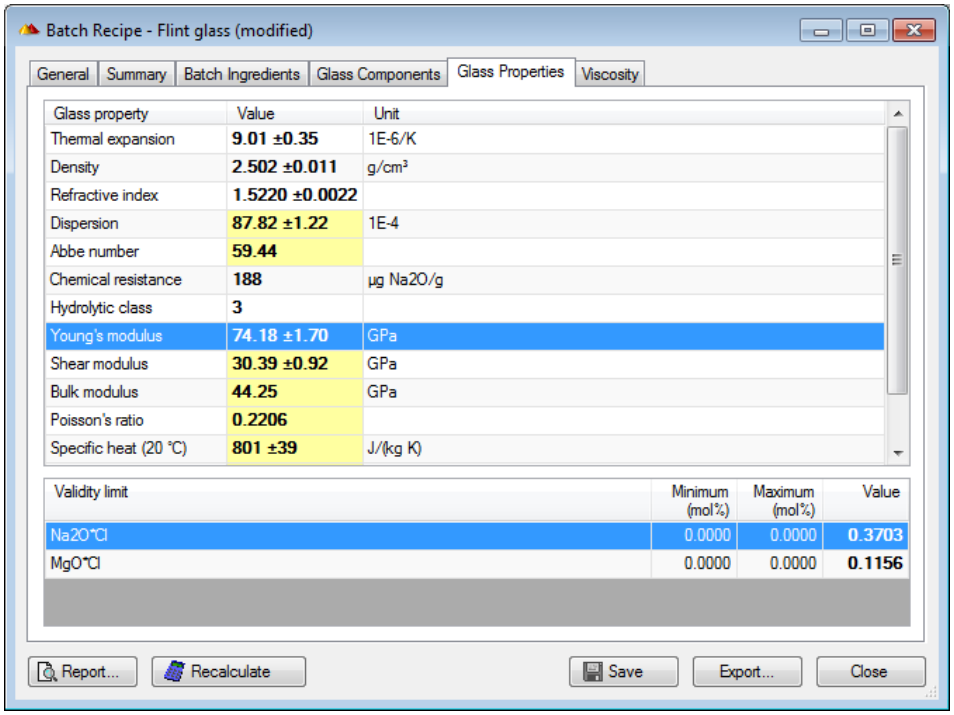
The specifications from the glass recipe are listed once again in the **Nominal** and **Tolerance** columns.

The percentages of the components in the glass calculated from the raw material weights are listed in the **Synthesis** column. The **Deviation** column states the absolute deviation of the calculated percentage from the nominal value.

The raw materials which according to chemical analysis contain the component marked in the left table in each case are listed in the detail table in the right part of the window.

4.3.5 Glass Properties

The glass properties calculated from the glass composition are listed on the **Glass Properties** tab card. You can configure in the **Options** window which glass properties are calculated here.

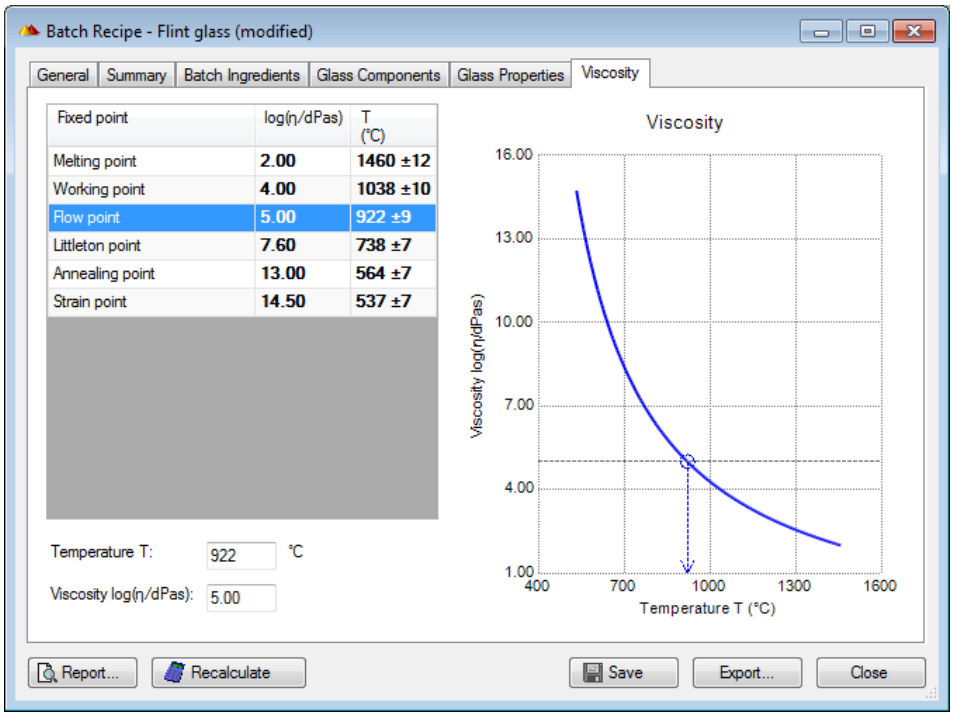


In this example the value for the Young's modulus is highlighted in yellow, since the validity limits defined for this property have been exceeded. If you mark the corresponding row with the mouse, you will see in the lower table the violated validity limits for this property and the calculated value for these.

4.3.6 Functional Glass Properties

If functional glass properties are activated in the options, further tab cards, e.g. for viscosity or electrical conductivity, appear as appropriate.

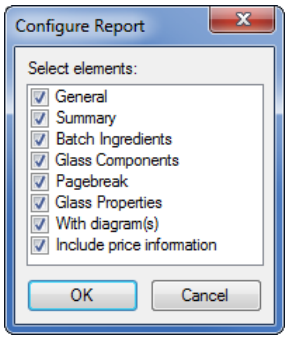
For instance, the temperatures calculated for the specified viscosity fixed points are listed and displayed graphically on the **Viscosity** tab card. You can select arbitrary points on the viscosity curve. The associated values are displayed in the boxes below the table.



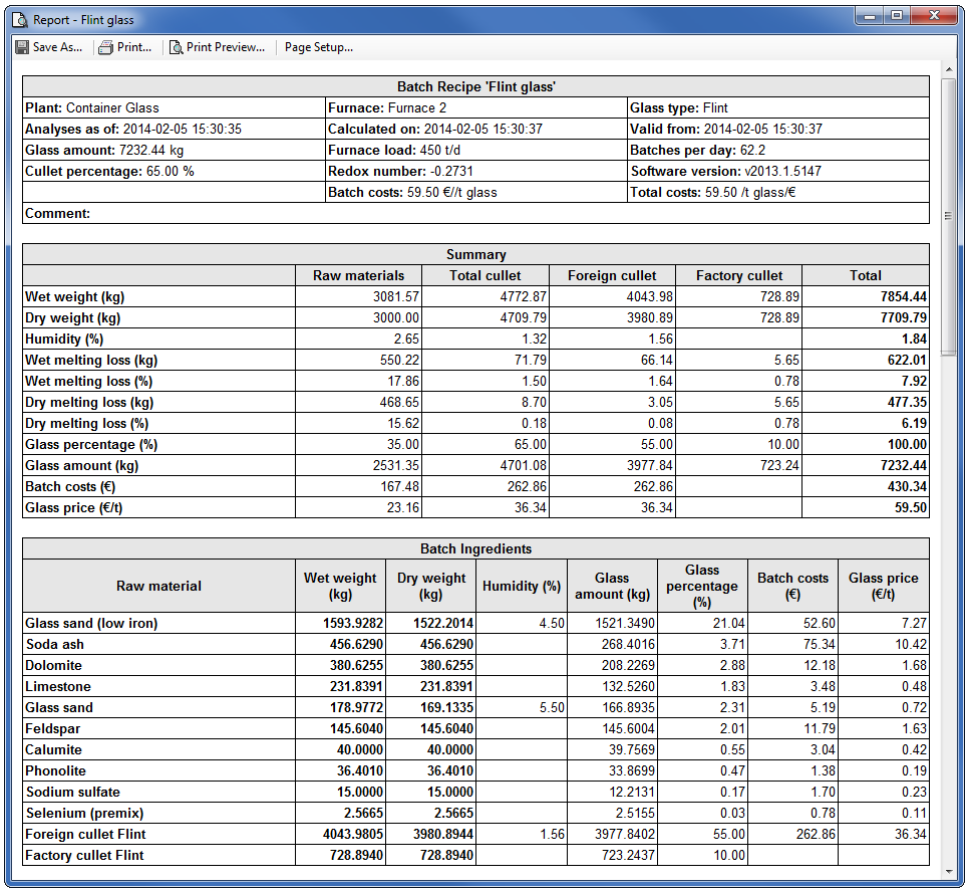
4.3.7 Displaying Report

The report display for batch recipes can be configured so that, for instance, you can generate a reduced report without price information:

- ➲ Click the **Report...** button.
- ➲ Select the elements that should be contained in the report from the **Configure Report** window. You can show or hide all price information via the **Include price information** element. By using the **Pagebreak** element you can insert a pagebreak before the glass property tables.



- ➲ After you click the **OK** button the report elements you have selected are displayed in a separate window.



Batch Recipe 'Flint glass'

Plant: Container Glass	**Furnace:** Furnace 2	**Glass type:** Flint
Analyses as of: 2014-02-05 15:30:35	**Calculated on:** 2014-02-05 15:30:37	**Valid from:** 2014-02-05 15:30:37
Glass amount: 7232.44 kg	**Furnace load:** 450 t/d	**Batches per day:** 62.2
Cullet percentage: 65.00 %	**Redox number:** -0.2731	**Software version:** v2013.1.5147
	Batch costs: 59.50 €/t glass	**Total costs:** 59.50 /t glass/€
Comment:		

Summary

	Raw materials	Total cullet	Foreign cullet	Factory cullet	Total
Wet weight (kg)	3081.57	4772.87	4043.98	728.89	**7854.44**
Dry weight (kg)	3000.00	4709.79	3980.89	728.89	**7709.79**
Humidity (%)	2.65	1.32	1.56		**1.84**
Wet melting loss (kg)	550.22	71.79	66.14	5.65	**622.01**
Wet melting loss (%)	17.86	1.50	1.64	0.78	**7.92**
Dry melting loss (kg)	468.65	8.70	3.05	5.65	**477.35**
Dry melting loss (%)	15.62	0.18	0.08	0.78	**6.19**
Glass percentage (%)	35.00	65.00	55.00	10.00	**100.00**
Glass amount (kg)	2531.35	4701.08	3977.84	723.24	**7232.44**
Batch costs (€)	167.48	262.86	262.86		**430.34**
Glass price (€/t)	23.16	36.34	36.34		**59.50**

Batch Ingredients

Raw material	Wet weight (kg)	Dry weight (kg)	Humidity (%)	Glass amount (kg)	Glass percentage (%)	Batch costs (€)	Glass price (€/t)
Glass sand (low iron)	**1593.9282**	**1522.2014**	4.50	1521.3490	21.04	52.60	7.27
Soda ash	**456.6290**	**456.6290**		268.4016	3.71	75.34	10.42
Dolomite	**380.6255**	**380.6255**		208.2269	2.88	12.18	1.68
Limestone	**231.8391**	**231.8391**		132.5260	1.83	3.48	0.48
Glass sand	**178.9772**	**169.1335**	5.50	166.8935	2.31	5.19	0.72
Feldspar	**145.6040**	**145.6040**		145.6004	2.01	11.79	1.63
Calumite	**40.0000**	**40.0000**		39.7569	0.55	3.04	0.42
Phonolite	**36.4010**	**36.4010**		33.8699	0.47	1.38	0.19
Sodium sulfate	**15.0000**	**15.0000**		12.2131	0.17	1.70	0.23
Selenium (premix)	**2.5665**	**2.5665**		2.5155	0.03	0.78	0.11
Foreign cullet Flint	**4043.9805**	**3980.8944**	1.56	3977.8402	55.00	262.86	36.34
Factory cullet Flint	**728.8940**	**728.8940**		723.2437	10.00		

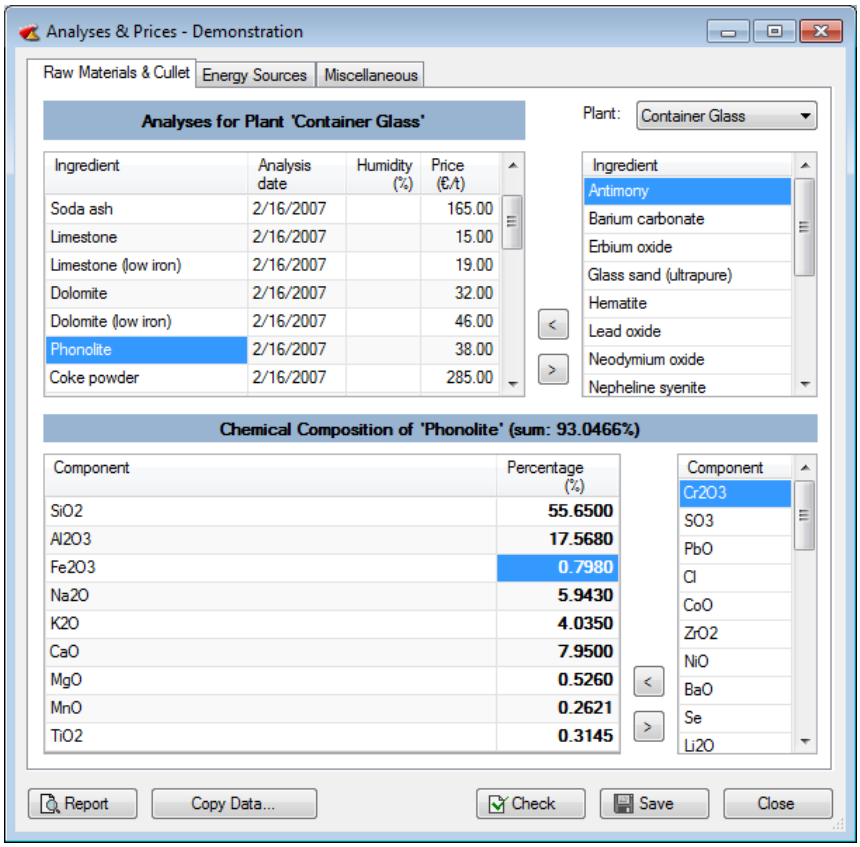
- ➲ Close the **Report** window.

4.4 Recalculating Batch Recipe

In the so-called correction test, the theoretical glass composition (synthesis) is recalculated and checked against the tolerances on the basis of the current chemical analyses and of the weights contained in the batch recipe. Therefore with this function you can check quickly and simply whether a tolerance is exceeded by the change of the chemical analyses (e.g. for a new raw material delivery) and due to this a recalculation from the glass recipe is necessary.

In the following example the chemical analyses are changed so that the tolerance for Fe_2O_3 is complied with. (For instance, in practice you have received a new raw material delivery with a changed analysis.)

- Open the analyses and prices via the **Edit ⇨ Analyses & Prices** menu command or via the **Edit Analyses and Prices** icon in the toolbar.
- Mark the ingredient **Phonolite** in the upper table.
- Change in the lower table the **Percentage** of Fe_2O_3 from 3.798 to **0.798** and the percentage of SiO_2 from 52.65 to **55.65**.

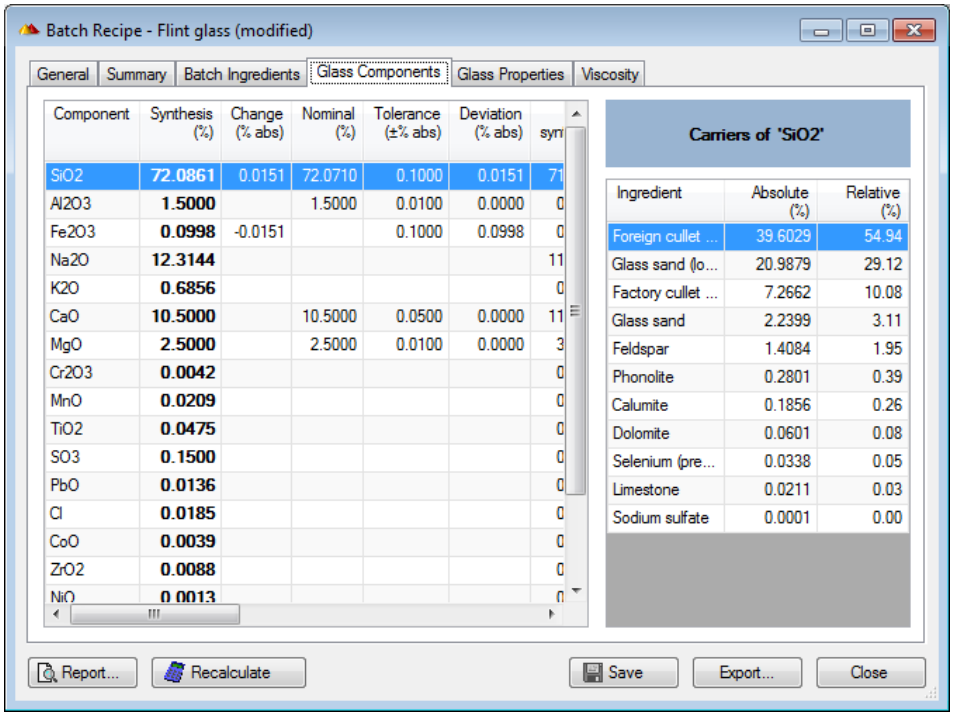


- Take over your changes with the **Save** button. If necessary use another file name in order not to overwrite the original sample configuration.

➲ Select the **Batch Recipe – Flint glass** entry from the **Window** menu to bring the batch recipe into the foreground.

➲ Click the **Recalculate** button in the **Batch Recipe** window or the icon of the same name in the toolbar.

The batch recipe is recalculated taking the new analysis into account without changing the raw material and cullet weights. An additional **Change** column which displays the change of the synthesis compared with the originally calculated version of the batch recipe appears on the **Glass Components** tab card next to the **Synthesis** column.



There has been no warning in the recalculation since this time all tolerances could be complied with. Correspondingly no component is highlighted in red.

NOTE: The **Change** column appears only directly after the recalculation of the batch recipe. If you save and reopen the batch recipe, the **Change** column is no longer displayed.

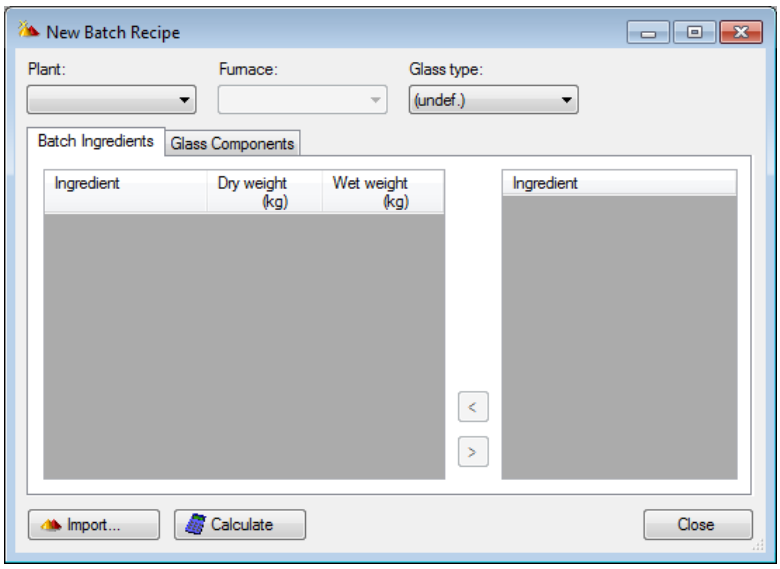
4.5 Calculating Batch Recipe from Raw Material Weights

As an alternative to calculating a batch recipe from a glass recipe, you can also calculate a batch recipe directly from specified raw material weights, e.g. if the chemical composition of the glass to be produced is not known.

To calculate a batch recipe from raw material weights:

➲ Select the **New ⇨ Batch Recipe** command from the **File** menu or click the **New Batch Recipe** icon in the toolbar.

The **New Batch Recipe** window opens.



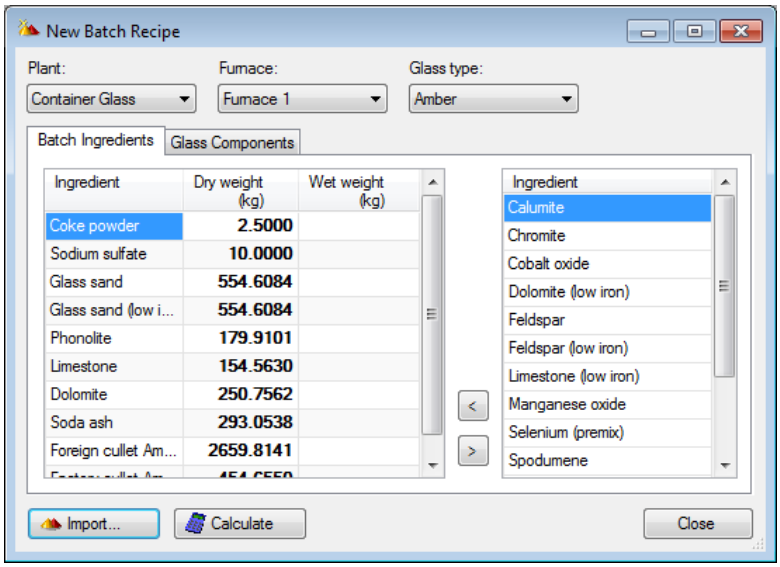
➲ Click the **Import...** button to load the master data, weights, nominal values and tolerances of an existing batch recipe from a .batch file.

➲ Select in the **Open Batch Recipe** window e.g. the **Amber glass.batch** file from the **Samples\Container Glass** folder and click the **Open** button.

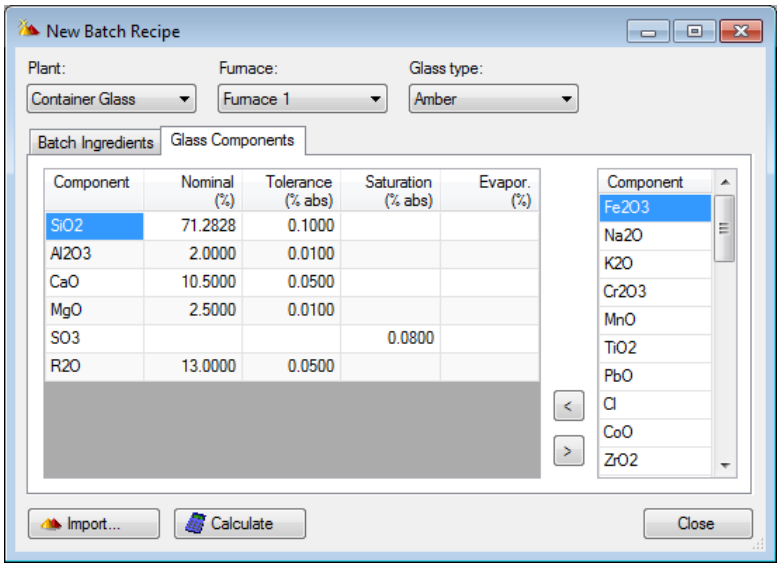
The data of the **Amber glass.batch** sample batch recipe are imported.

NOTE: As an alternative to importing an existing batch recipe, you can also enter the data manually, or else subsequently change manually the data of an imported batch recipe. To do this select the wanted plant, the furnace and the glass type from the dropdown list box and enter the corresponding data on the **Batch Ingredients** and **Glass Components** tab cards.

The raw material and cullet weights of the batch recipe are entered on the **Batch Ingredients** tab card:

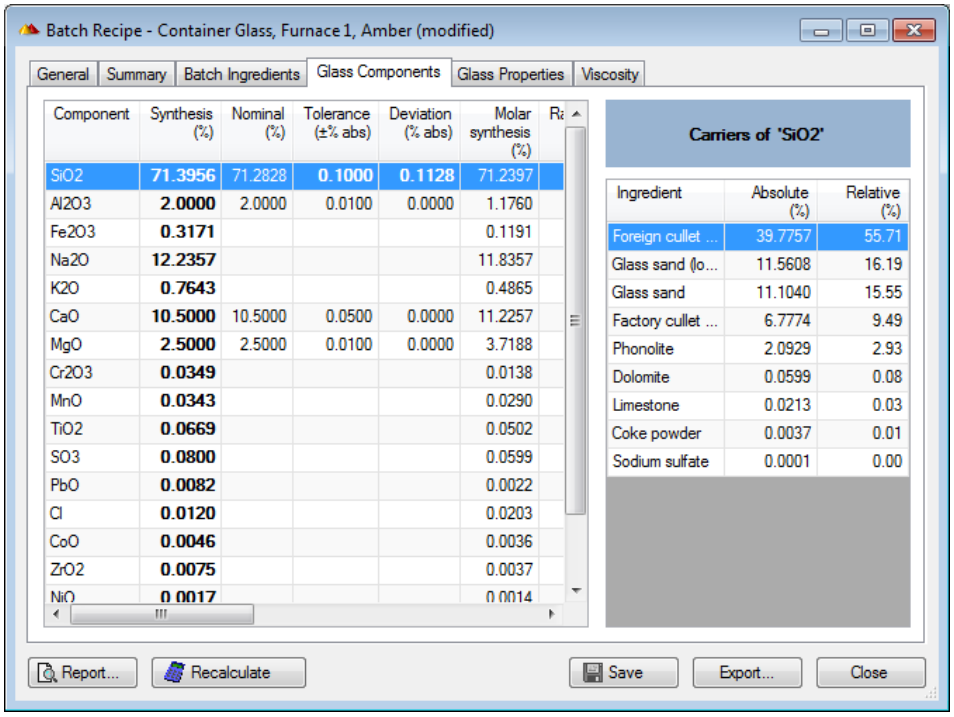


The nominal values, tolerances, saturations and evaporation values of the individual components were entered, if available, on the **Glass Components** tab card. Here, the nominal values are only used for checking the tolerances and are not considered for the batch calculation.



➲ Click the **Calculate** button to calculate the batch recipe from the input.

The calculated batch recipe is displayed in the **Batch Recipe** window:

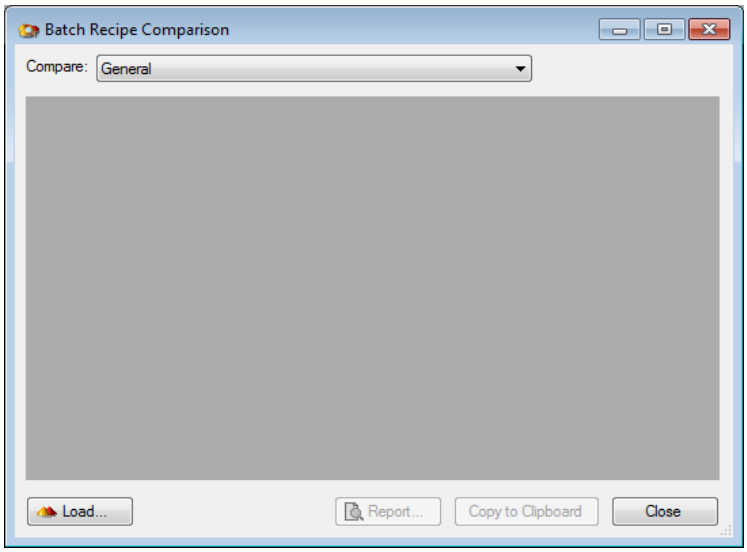


4.6 Comparing Batch Recipes

BATCHMAKER SUITE contains a function which makes it possible to display and compare data from multiple batch recipes.

➲ Select the **Batch Recipe Comparison** command from the **Tools** menu or click the corresponding icon in the toolbar.

The **Batch Recipe Comparison** window opens.

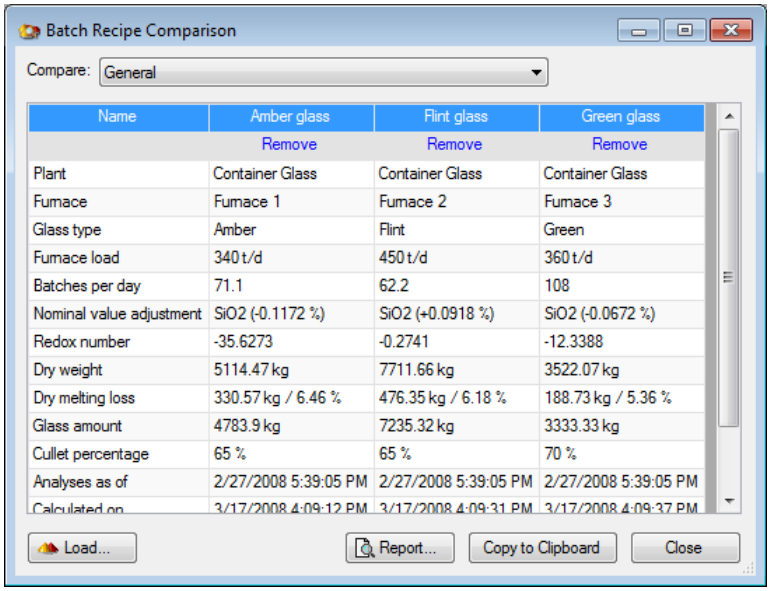


➲ Click the **Load** button in the **Glass 1** column.

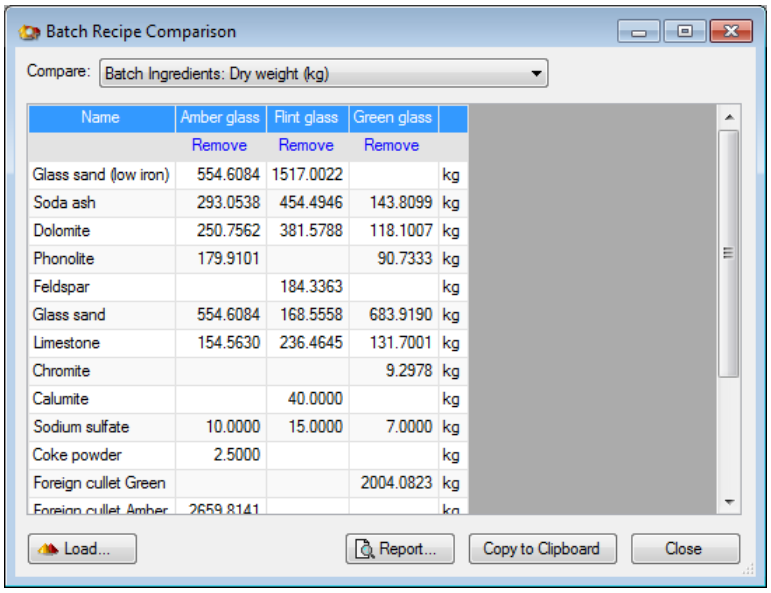
➲ Select the three batch recipes from the **Samples\Container Glass** folder and confirm your selection with **Open**.

NOTE: Alternatively you can drag & drop batch recipes from the File Manager into the window.

The selected batch recipes are loaded and the data is displayed in tabular form.



➲ Under **Compare** select the desired data category you want to compare, e.g. **Batch Ingredients: Dry weight (kg)**.



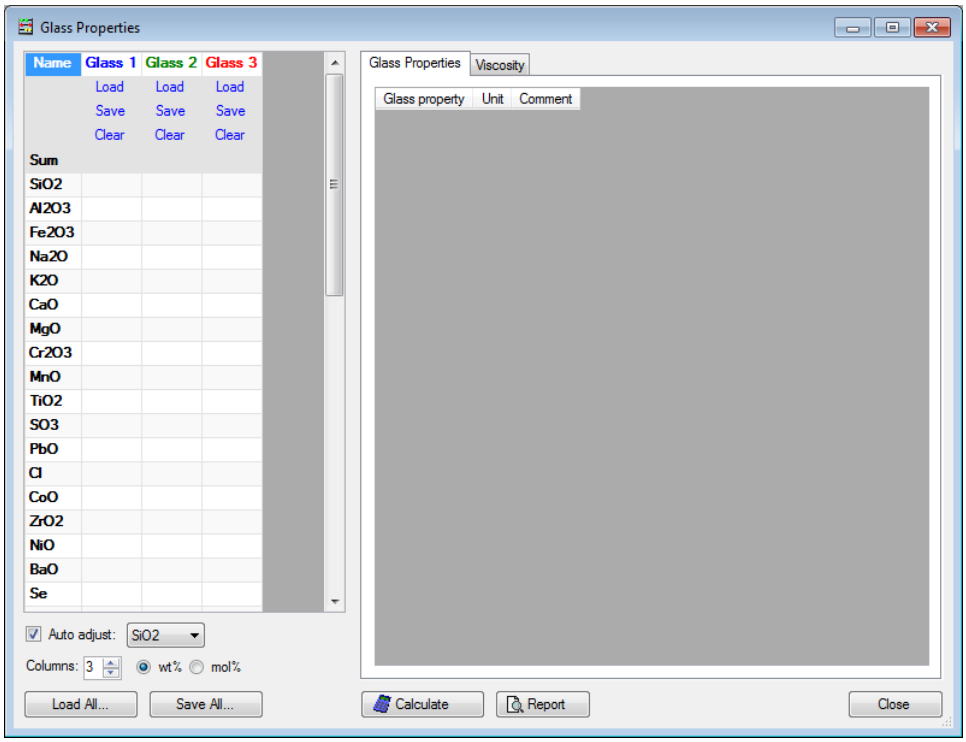
You can also have the data displayed in report form here with the **Report** button. The results are copied into the Windows clipboard with the **Copy to Clipboard** button, so that you can process them further in other applications, such as Microsoft Excel.

4.7 Calculating Glass Properties

BATCHMAKER SUITE contains a glass property calculator with which you can calculate from their chemical composition and compare the glass properties of different glasses.

➲ Select the **Glass Properties** command from the **Tools** menu or click the icon of the same name in the toolbar.

The **Glass Properties** window opens.



➲ Click the **Load** button in the **Glass 1** column.

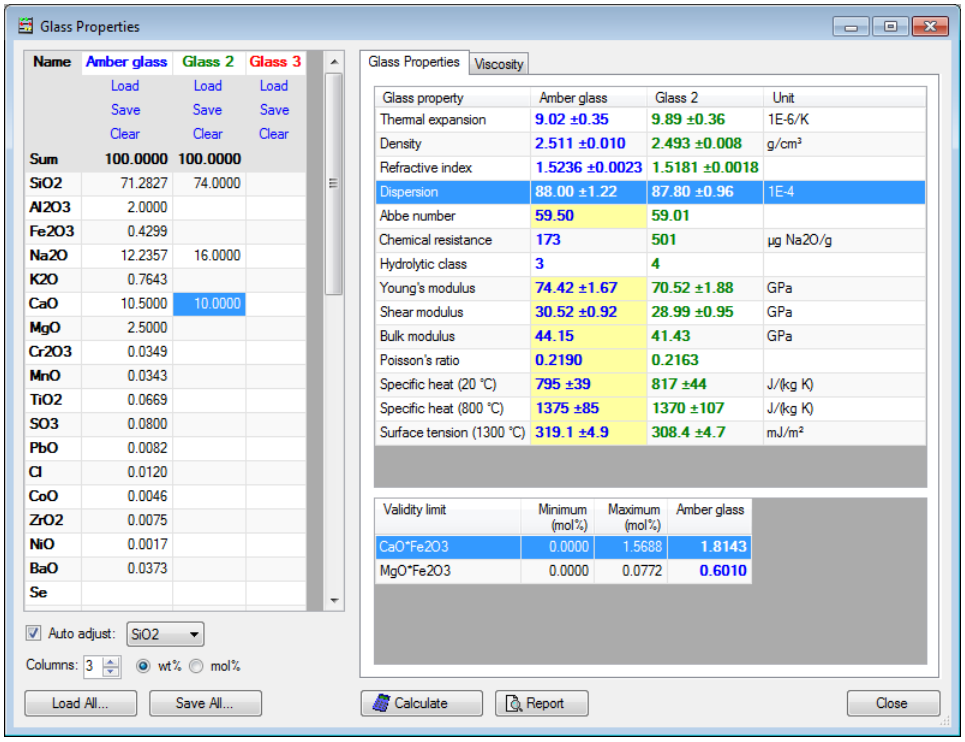
➲ Select the **Amber glass.batch** sample batch recipe from the **Samples\Container Glass** folder and confirm your selection with **Open**.

NOTE: Alternatively you can drag & drop batch recipes from the File Manager into the window.

The calculated glass composition of the batch recipe is loaded into the first column on the table on the left hand side of the window.

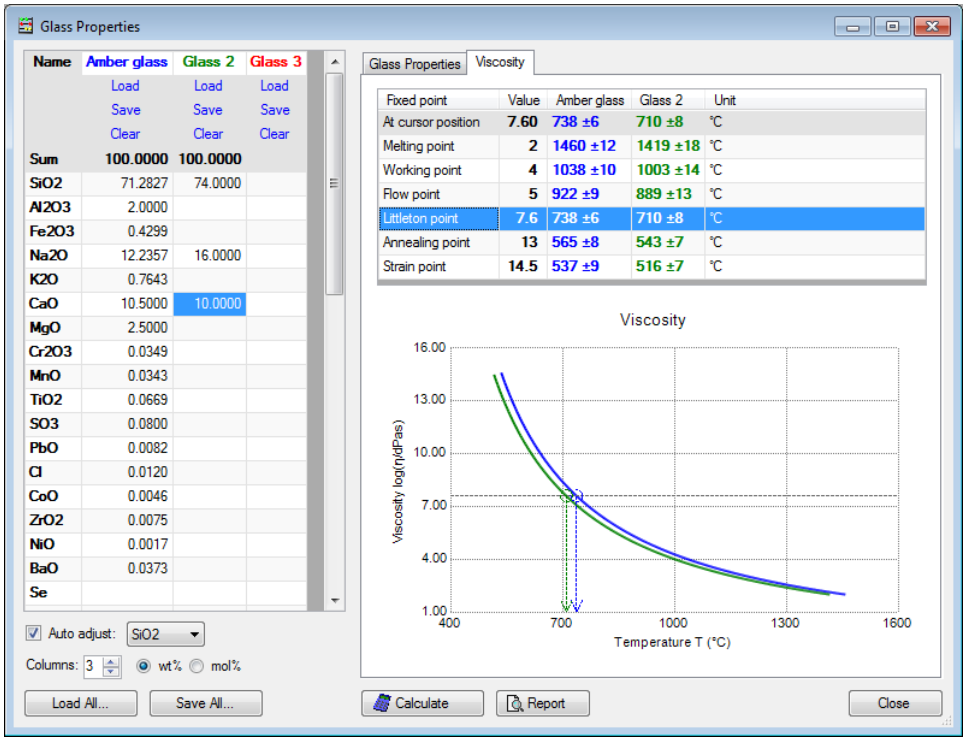
➲ Enter a glass composition of 16% Na_2O, 10% CaO and 74% SiO_2 manually into the second column of the table (by default, the SiO_2 percentage is calculated automatically). Enter **`Sample`** in the column heading as the name for this composition.

➲ Click the **Calculate** button.


Glass Properties
Name Amber glass Glass 2 Glass 3
Load Load Load
Save Save Save
Clear Clear Clear
Sum 100.0000 100.0000
SiO2 71.2827 74.0000
Al2O3 2.0000
Fe2O3 0.4299
Na2O 12.2357 16.0000
K2O 0.7643
CaO 10.5000 10.0000
MgO 2.5000
Cr2O3 0.0349
MnO 0.0343
TiO2 0.0669
SO3 0.0800
PbO 0.0082
Cl 0.0120
CoO 0.0046
ZrO2 0.0075
NiO 0.0017
BaO 0.0373
Se
Auto adjust: SiO2
Columns: 3 wt% mol%
Load All... Save All...
Glass Properties Viscosity
Glass property Amber glass Glass 2 Unit
Thermal expansion 9.02 ±0.35 9.89 ±0.36 1E-6/K
Density 2.511 ±0.010 2.493 ±0.008 g/cm³
Refractive index 1.5236 ±0.0023 1.5181 ±0.0018
Dispersion 88.00 ±1.22 87.80 ±0.96 1E-4
Abbe number 59.50 59.01
Chemical resistance 173 501 µg Na2O/g
Hydrolytic class 3 4
Young's modulus 74.42 ±1.67 70.52 ±1.88 GPa
Shear modulus 30.52 ±0.92 28.99 ±0.95 GPa
Bulk modulus 44.15 41.43 GPa
Poisson's ratio 0.2190 0.2163
Specific heat (20 °C) 795 ±39 817 ±44 J/(kg K)
Specific heat (800 °C) 1375 ±85 1370 ±107 J/(kg K)
Surface tension (1300 °C) 319.1 ±4.9 308.4 ±4.7 mJ/m²
Validity limit Minimum (mol%) Maximum (mol%) Amber glass
CaO*Fe2O3 0.0000 1.5688 1.8143
MgO*Fe2O3 0.0000 0.0772 0.6010
Calculate Report Close

The glass properties for the two compositions are displayed on the tab cards in the right-hand area of the window. You define in the **Options** of BATCHMAKER SUITE which properties are calculated here.

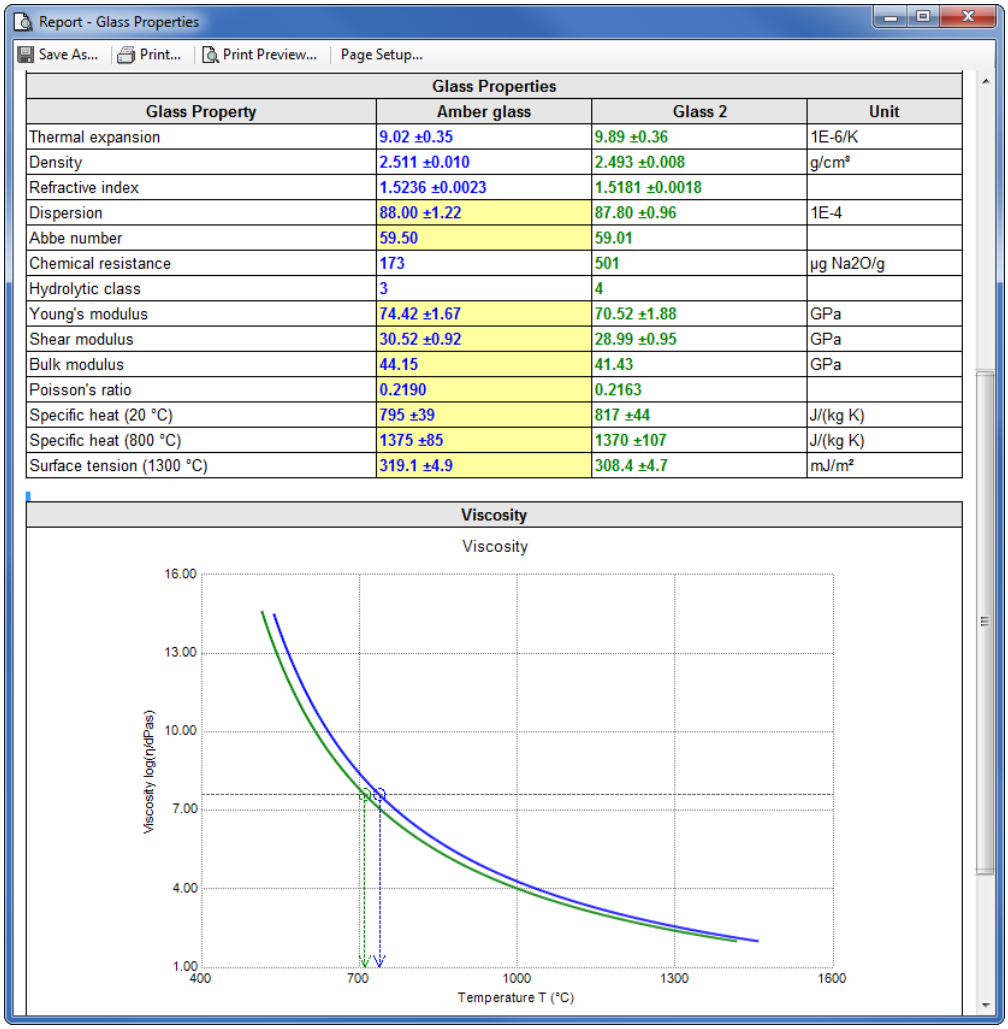
➲ Switch to the **Viscosity** tab card.



If you select a viscosity fixed point in the upper table the corresponding values are marked in the graphs. By using the mouse wheel or the context menu you can enlarge or reduce the visible diagram area. To pan the diagram hold down the right mouse button and move the mouse.

➲ Select the **Standard view** command from the context menu to return to the original scale.

➲ Click the **Report** button to display the data as a report.


Report - Glass Properties
Save As...
Print...
Print Preview...
Page Setup...
Glass Properties
Glass Property | Amber glass | Glass 2 | Unit
Thermal expansion | 9.02 ±0.35 | 9.89 ±0.36 | 1E-6/K
Density | 2.511 ±0.010 | 2.493 ±0.008 | g/cm³
Refractive index | 1.5236 ±0.0023 | 1.5181 ±0.0018 |
Dispersion | 88.00 ±1.22 | 87.80 ±0.96 | 1E-4
Abbe number | 59.50 | 59.01 |
Chemical resistance | 173 | 501 | µg Na2O/g
Hydrolytic class | 3 | 4 |
Young's modulus | 74.42 ±1.67 | 70.52 ±1.88 | GPa
Shear modulus | 30.52 ±0.92 | 28.99 ±0.95 | GPa
Bulk modulus | 44.15 | 41.43 | GPa
Poisson's ratio | 0.2190 | 0.2163 |
Specific heat (20 °C) | 795 ±39 | 817 ±44 | J/(kg K)
Specific heat (800 °C) | 1375 ±85 | 1370 ±107 | J/(kg K)
Surface tension (1300 °C) | 319.1 ±4.9 | 308.4 ±4.7 | mJ/m²
Viscosity
Viscosity
16.00
13.00
10.00
7.00
4.00
1.00
Viscosity log(η/dPas)
400
700
1000
1300
1600
Temperature T (°C)

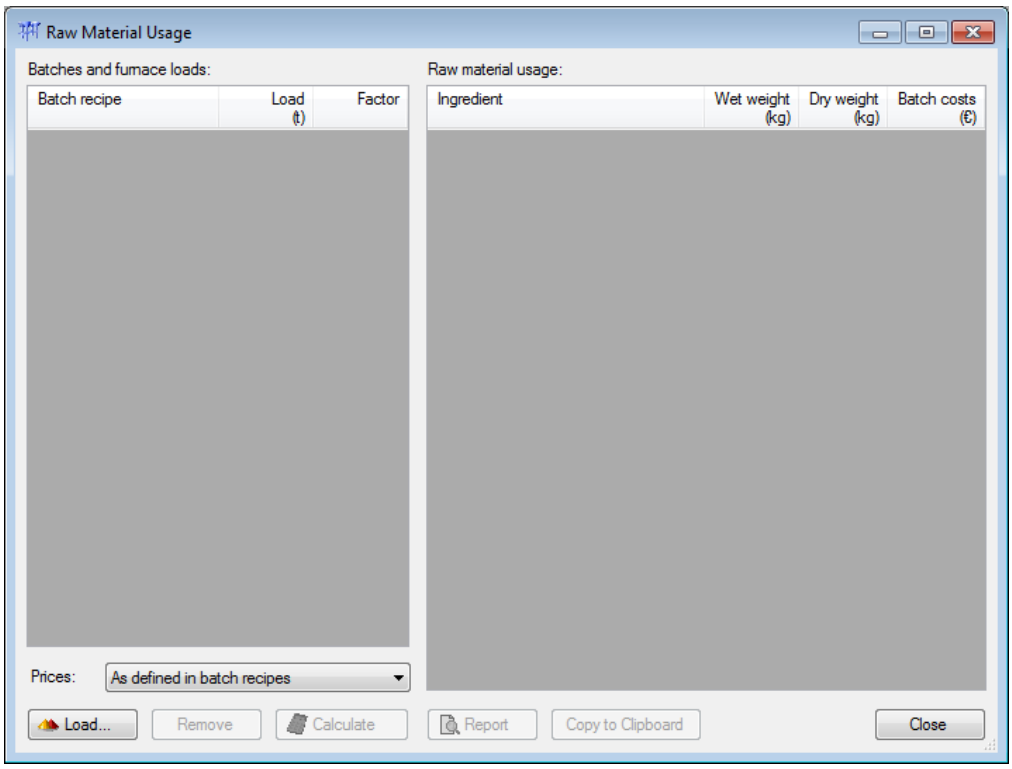
NOTE: If you want to save the report, including the viscosity curve, select **Web Archive, single file (*.mht)** as file type.

4.8 Calculating Raw Material Usage

BATCHMAKER SUITE contains a usage calculator with which you can calculate from arbitrary batch recipes over selectable periods and tonnages the total consumption and the costs of raw materials and cullet.

➲ Select the **Raw Material Usage** command from the **Tools** menu or click the icon of the same name in the toolbar.

The **Raw Material Usage** window opens.



➲ Click the **Load...** button.

➲ Select the **Amber glass.batch** batch recipe from the **Samples\Container Glass** folder and confirm your selection with **Open**.

NOTE: Alternatively you can drag & drop batch recipes from the File Manager into the window.

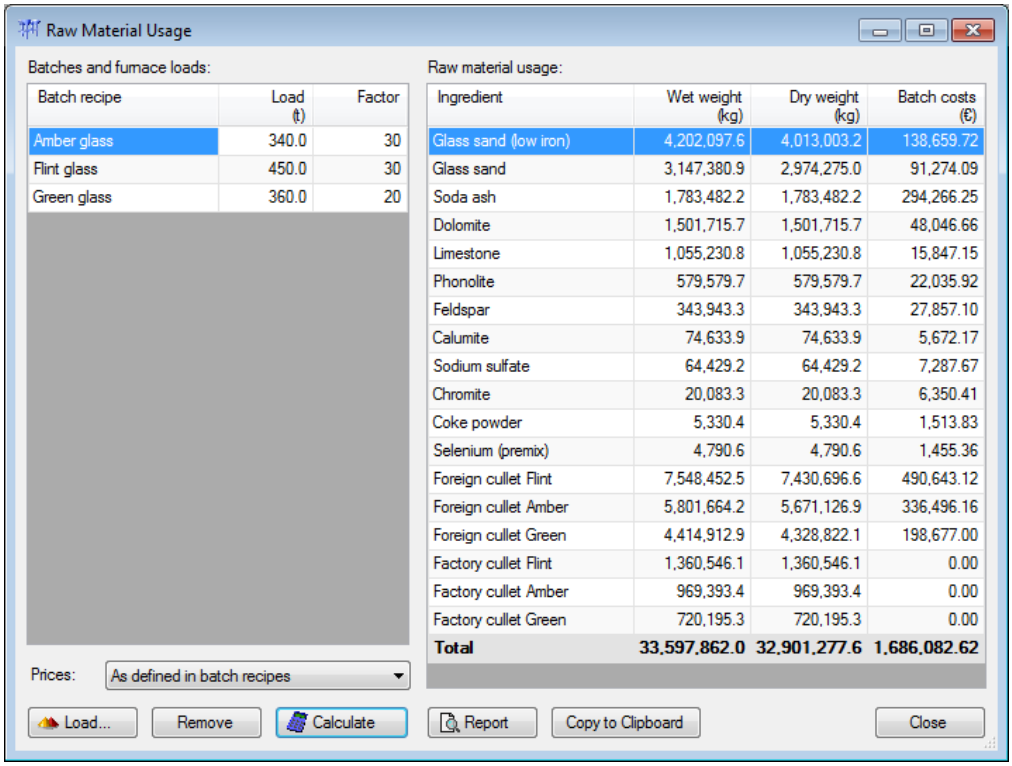
The batch recipe is loaded and inserted in the **Batches and furnace loads** list.

➲ Enter the value **30** as **Factor**. The batch recipe should therefore be used in production for thirty days with an average **Load** of 340 t.

➲ Insert in this way one after the other the **Flint glass.batch** sample batch recipe with a factor of **30** and **Green glass.batch** with a factor of **20**.

➲ Click the **Calculate** button.

The total usages and the batch costs of all raw materials and cullet used in these batch recipes appear in the right-hand table.


Raw Material Usage
Batches and furnace loads:
Batch recipe | Load (t) | Factor
Amber glass | 340.0 | 30
Flint glass | 450.0 | 30
Green glass | 360.0 | 20
Raw material usage:
Ingredient | Wet weight (kg) | Dry weight (kg) | Batch costs (€)
Glass sand (low iron) | 4,202,097.6 | 4,013,003.2 | 138,659.72
Glass sand | 3,147,380.9 | 2,974,275.0 | 91,274.09
Soda ash | 1,783,482.2 | 1,783,482.2 | 294,266.25
Dolomite | 1,501,715.7 | 1,501,715.7 | 48,046.66
Limestone | 1,055,230.8 | 1,055,230.8 | 15,847.15
Phonolite | 579,579.7 | 579,579.7 | 22,035.92
Feldspar | 343,943.3 | 343,943.3 | 27,857.10
Calumite | 74,633.9 | 74,633.9 | 5,672.17
Sodium sulfate | 64,429.2 | 64,429.2 | 7,287.67
Chromite | 20,083.3 | 20,083.3 | 6,350.41
Coke powder | 5,330.4 | 5,330.4 | 1,513.83
Selenium (premix) | 4,790.6 | 4,790.6 | 1,455.36
Foreign cullet Flint | 7,548,452.5 | 7,430,696.6 | 490,643.12
Foreign cullet Amber | 5,801,664.2 | 5,671,126.9 | 336,496.16
Foreign cullet Green | 4,414,912.9 | 4,328,822.1 | 198,677.00
Factory cullet Flint | 1,360,546.1 | 1,360,546.1 | 0.00
Factory cullet Amber | 969,393.4 | 969,393.4 | 0.00
Factory cullet Green | 720,195.3 | 720,195.3 | 0.00
Total | 33,597,862.0 | 32,901,277.6 | 1,686,082.62
Prices:
As defined in batch recipes
Load...
Remove
Calculate
Report
Copy to Clipboard
Close

You can also have the data displayed in report form here with the **Report** button. The results are copied into the Windows clipboard with the **Copy to Clipboard** button, so that you can process them further in other applications, such as Microsoft Excel.